

#### US Army Corps of Engineers Louisville District

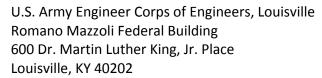
#### **CONTRACT NUMBER**

W912QR-23413770 CERTIFIED FINAL

# PN71712 Live Fire Exercise Shoothouse Fort Campbell, Kentucky









# SECTION 01 10 00.FINAL TASK ORDER STATEMENT OF WORK

1.0	PROJECT OBJECTIVES
1.1.	SECTION ORGANIZATION
2.0	SCOPE
2.1.	LIVE FIRE SHOOTHOUSE (LVSH)
2.2.	SITE
2.3.	GOVERNMENT-FURNISHED GOVERNMENT INSTALL EQUIPMENT (GFGI)
2.4.	FURNITURE REQUIREMENTS
3.0	LIVE FIRE SHOOTHOUSE (LVSH)
3.1.	GENERAL REQUIREMENTS
3.1.1.	FACILITY DESCRIPTION
3.1.2.	FACILITY RELATIONSHIPS
3.1.3.	ACCESSIBILITY REQUIREMENTS
3.1.4.	BUILDING AREAS
3.1.5.	ADAPT BUILD MODEL - NOT USED
3.2.	FUNCTIONAL AND AREA REQUIREMENTS
3.2.1.	FUNCTIONAL SPACES
3.3.	SITE FUNCTIONAL REQUIREMENTS
3.4.	SITE AND LANDSCAPE REQUIREMENTS
3.5.	ARCHITECTURAL REQUIREMENTS
3.5.1.	FINISHES AND INTERIOR SPECIALITIES
3.6.	SEE PARAGRAPH 5.5 STRUCTURAL REQUIREMENTS
3.7.	SEE PARAGRAPH 6.7 THERMAL PERFORMANCE – NOT USED
3.8.	PLUMBING REQUIREMENTS
3.9.	COMMUNICATIONS AND SECURITY SYSTEMS
3.10.	ELECTRICAL REQUIREMENTS

3.11. HEATING VENTILATING AND AIR CONDITIONING (HVAC) REQUIREMENTS

- 3.12. ENERGY CONSERVATION REQUIREMENTS
- 3.13. FIRE PROTECTION REQUIREMENTS
- 3.14. SEE PARAGRAPH 5.12 AND 6.14 SUSTAINABLE DESIGN NOT USED
- 3.15. SEE PARAGRAPH 6.15 ENVIRONMENTAL NOT USED
- 3.16. SEE PARAGRAPH 6.16 PERMITS NOT USED
- 3.17. SEE PARAGRAPH 6.17 DEMOLITION NOT USED
- 3.18. SEE PARAGRAPH 6.18 ADDITIONAL FACILITIEIS NOT USED
- 3.19. EQUIPMENT AND FURNITURE REQUIREMENTS
- 3.19.1. FURNISHINGS NOT USED
- 3.19.2. EQUIPMENT NOT USED
- 3.20. FACILITY SPECIFIC REFERENCES
- 4.0 APPLICABLE CRITERIA
- 4.1. INDUSTRY CRITERIA
- 4.2. MILITARY CRITERIA
- 5.0 GENERAL TECHNICAL REQUIREMENTS
- 5.1. SITE PLANNING AND DESIGN
- 5.2. SITE ENGINEERING
- 5.3. COMMISSIONING
- 5.4. ARCHITECTURE AND INTERIOR DESIGN
- 5.5. STRUCTURAL DESIGN
- 5.6. THERMAL PERFORMANCE
- 5.7. PLUMBING AND WATER CONSUMING EQUIPMENT
- 5.8. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS
- 5.9. HEATING, VENTILATING AND AIR CONDITIONING
- 5.10. ENERGY CONSERVATION
- 5.11. FIRE PROTECTION
- 5.12. SUSTAINABLE DESIGN
- 5.13. SECURITY (ANTI-TERRORISM STANDARDS)

#### 6.0 PROJECT SPECIFIC REQUIREMENTS

- 6.1. GENERAL
- 6.2. APPROVED DEVIATIONS
- 6.3. SITE PLANNING AND DESIGN
- 6.4. SITE ENGINEERING
- 6.5. ARCHITECTURE
- 6.6. STRUCTURAL DESIGN
- 6.7. THERMAL PERFORMANCE
- 6.8. PLUMBING
- 6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS
- 6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS
- 6.11. HEATING, VENTILATING AND AIR CONDITIONING
- 6.12. ENERGY CONSERVATION
- 6.13. FIRE PROTECTION
- 6.14. SUSTAINABLE DESIGN
- 6.15. ENVIRONMENTAL
- 6.16. PERMITS
- 6.17. DEMOLITION
- 6.18. ADDITIONAL FACILITIES

#### 1.0 PROJECT OBJECTIVES

Section: 01 10 00

1.0.1 The project objective is to design and construct facilities for the military that are consistent with the design and construction practices used for civilian sector projects that perform similar functions to the military projects. For example, a Company Operations Facility has the similar function as an office/warehouse in the civilian sector; therefore the design and construction practices for a company operations facility should be consistent with the design and construction of an office/warehouse building.

#### **Comparison of Military Facilities to Civilian Facilities**

Military Facility	Civilian Facility
Live Fire Shoothouse (LVSH)	

- 1.0.2 It is the Army's objective that these buildings will have a 50 year useful life. The design and construction should provide an appropriate level of quality to ensure the continued use of the facility over that time period with the application of reasonable preventive maintenance and repairs that would be industry-acceptable to a major civilian sector project OWNER. The facility design should consider that the Army may repurpose the use of the facility over the 50 year life. The Army's intent is to install products and materials of good quality that meet industry standard average life that corresponds with the period of performance expected before a major renovation or repurpose. The design should be flexible and adaptable to possible future uses different than the current to the extent practical while still meeting the operational and functional requirements defined within. Flexibility is achieved through design of more flexible structural load-bearing wall and column system arrangements. The site infrastructure will have at least a 50-year life expectancy with industry-accepted maintenance and repair cycles. Develop the project site for efficiency and to convey a sense of unity or connectivity with the adjacent buildings and with the Installation as a whole.
- 1.0.3 Requirements stated in this contract are minimums. Innovative, creative, and life cycle cost effective solutions, which meet or exceed these requirements are encouraged. Further, the OFFEROR is encouraged to seek solutions that will expedite construction (panelization, pre-engineered, etc.) and shorten the schedule. The intent of the Government is to emphasize the placement of funds into functional/operational requirements. Materials and methods should reflect this by choosing the most economical Type of Construction allowed by code for this occupancy/project allowing the funding to be reflected in the quality of interior/exterior finishes and systems selected.

#### 1.1. SECTION ORGANIZATION

This Section is organized under 6 major "paragraphs".

- (1) Paragraph 1 is intended to define the project objectives and to provide a comparison between the military facility(ies) and comparable "civilian" type buildings.
- (2) Paragraph 2 describes the scope of the project.
- (3) Paragraph 3 provides the functional, operational and facility specific design criteria for the specific facility type(s) included in this contract or task order.
- (4) Paragraph 4 lists applicable industry and government design criteria, generally applicable to all facility types, unless otherwise indicated in the Section. It is not intended to be all-inclusive. Other industry and government standards may also be used, where necessary to produce professional designs, unless they conflict with those listed.
- (5) Paragraph 5 contains Army Standard Design Criteria, generally applicable to all facility types, unless otherwise indicated in the Section.
- (6) Paragraph 6 contains installation and project specific criteria supplementing the other 5 paragraphs.

#### 2.0 SCOPE

Section: 01 10 00

#### 2.1. LIVE FIRE EXERCISE SHOOTHOUSE (LFSH)

Provide the Live Fire Exercise Shoothouse (LFSH) as defined by standard Range criteria and the Project Definition Matrix (PDM). This project type is to provide the leader with a facility to train and evaluate the unit during a live fire exercise. Units are trained and evaluated on their ability to move tactically (enter and clear a room; enter and clear a building), engage targets, conduct breaches and practice target discrimination. The targetry system will be Government Furnished and Government Installed (GFGI).

Project Definition Matrix: Incorporated in the RFP at the end of Paragraph 3.0

#### 2.2. SITE:

Section: 01 10 00

Provide all site improvements necessary to support the new building facilities. Refer to Paragraph 6.

Approximate area available 1.50 acres

#### 2.3. GOVERNMENT-FURNISHED GOVERNMENT-INSTALLED EQUIPMENT (GFGI)

Coordinate with Government on GFGI item requirements and provide suitable structural support, brackets for projectors/VCRs/TVs, all utility connections and space with required clearances for all GFGI items. Fire extinguishers are GF/GI personal property, while fire extinguisher brackets and cabinets are Contractor furnished and installed CF/CI. All Computers and related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items: Targetry equipment, cameras, speakers and AAR control system (See Section 01 10 00, Paragraph 3).

#### 2.4. FURNITURE REQUIREMENTS

Provide furniture design for all spaces listed in Chapter 3 and including any existing furniture and equipment to be re-used. Coordinate with the user to define requirements for furniture systems, movable furniture, storage systems, equipment, any existing items to be reused, etc. Early coordination of furniture design is required for a complete and usable facility.

The procurement and installation of furniture is NOT included in this contract. Furniture will be provided and installed under a separate furniture vendor/installer contract. The general contractor shall accommodate that effort with allowance for entry of the furniture vendor/installer onto this project site at the appropriate time to permit completion of the furniture installation for a complete and usable facility to coincide with the Beneficial Occupancy Date (BOD) of this project. The furniture vendor/installer contract will include all electrical pre-wiring and the whips for final connection to the building electrical systems however; the general contractor shall make the final connections to the building electrical systems under this contract. Furthermore, the general contractor shall provide all Information/Technology (IT) wiring (i.e. LAN, phone, etc.) up to and including the face plate of all freestanding and/or systems furniture desk tops as applicable, the services to install the cable and face plates in the furniture, the coordination with the furniture vendor/installer to accomplish the installation at the appropriate time, and all the final IT connections to the building systems under this contract.

The Government reserves the right to change the method for procurement of and installation of furniture to Contractor Furnished/Contractor Installed (CF/CI). CF/CI furniture will require competitive open market procurement by the Contractor using the Furniture, Fixtures and Equipment (FF&E) package. Reference applicable appendix for Preliminary FF&E Information including furniture dimensions sizes as shown in the Standard Design.

Page 42 of 947

Section: 01 10 00

#### 3.0 LIVE FIRE EXERCISE SHOOTHOUSE (LFSH)

#### 3.1. GENERAL REQUIREMENTS:

- A. The controlling documents for this range project are the current approved DD1391 Military Construction Project Data and the CEHNC 1110-1-23 Live Fire Exercise Shoothouse (LFSH) Design Volume. The Design Volume can be found at <a href="https://www.hnd.usace.army.mil/rdg/intertemplate.aspx">www.hnd.usace.army.mil/rdg/intertemplate.aspx</a> under the title (LFSH) Live Fire Exercise Shoothouse.
- B. The information in the Design Volume and this document is based on Training Circular (TC) 25-8 Training Ranges dated 2010, Facility Category Code (FCC) 17879
- C. Coordination at all stages of design development of LFSH new construction projects is required with the Installation DPW (facilities engineer), IMCOM Center of Expertise, and Installation DPTMS (Range Control)
- D. The designer/constructor of this range is strongly urged to coordinate closely with the customer's live-fire range training subject matter experts so that he can understand the training objectives of this type of facility. Even though the engineering and construction techniques in this type of range are not extremely complex, the objectives of the project are unique to live-fire training. The designer/constructor is required to have a live-fire range training subject matter expert on his team to ensure that all military training issues are understood.
- E. The designer/constructor of this range must be aware of and comply with the Construction Compliance Inspection (CCI) and Target Interface Inspection (TII) appendix of the Design Volume.
- F. Unexploded Ordnance (UXO): The potential for UXO always exists on military property and is a potentially serious problem on all range projects. Special restrictions on construction operations are specified in Paragraph 6 of this section

#### 3.1.1. FACILITY DESCRIPTION

The Live Fire Exercise Shoothouse, FCC 17879, provides units with a facility to train and evaluate individual Soldiers and squads on tasks necessary to move tactically (enter and clear a room; enter and clear a building), engage targets, conduct breaches, and practice target discrimination in a live-fire environment.

#### 3.1.2. FACILITY RELATIONSHIPS

A separate contractor will enter the project after construction is complete to install targetry and the targetry control system. They will be installing this equipment using the interface points established during this design-build contract. Therefore, deviation from standards depicted in the Design Volume is prohibited.

#### 3.1.3. ACCESSIBILITY REQUIREMENTS

Training Ranges are restricted by occupancy classification to use only by able-bodied military personnel during the expected useful life of the building or facility and need not be accessible.

#### 3.1.4. BUILDING AREAS

Refer to Project Definition Matrix (PDM).

#### 3.1.5. ADAPT BUILD MODEL - NOT USED

### 3.2. FUNCTIONAL AND OPERATIONAL REQUIREMENTS

#### 3.2.1. FUNCTIONAL SPACES

Section: 01 10 00

A. The LFSH is comprised of the Range Operations and Control Area (ROCA) and the down range area.

- B. RANGE OPERATIONS AND CONTROL AREA: The Range Operations and Control Area (ROCA) is the center for overall control and operation of the range, training exercises, administrative services, and support facilities. From the range operations and control area, downrange target and simulation equipment are operated and activities are monitored for scoring and performance data review. The data is collected and distributed to the participants for an after action review. The location of the buildings is critical for the command and control during training operations on the range; therefore, coordination with the installation user is mandatory for the placement of the ROCA buildings on the construction site. The ROCA is comprised of multiple vertical construction components which are defined in the Project Specific Matrix. The command & control system and targetry equipment will be Government Furnished and Government Installed (GFGI).
- 1) <u>Down Range Area</u>. The Downrange Area consists of the actual Shoothouse and support equipment that provide the user the capability to meet current army training standards. In conjunction with this, each site-specific project may include necessary site amenities, such as site improvements, vehicle parking area, access roads, service trails, and exterior utilities. The command & control system and targetry equipment will be Government Furnished and Government Installed (GFGI).
- 2) <u>Surface Danger Zone (SDZ)</u>. An SDZ for the layout depicted in Appendix J has been validated by the Installation safety office. Any changes made to the layout during design development that may affect the validated SDZ shall be approved by the Installation safety office.

#### 3.3. SITE FUNCTIONAL REQUIREMENTS

The range's functional layout and adjacency requirements are as indicated on drawings contained in the Design Volume and, if applicable, as depicted in Appendix J. The extent to which the drawings represent required or preferred layouts and the allowable latitude for changes to them is as noted on the drawings. The layout of the Range Operations and Control Area is dependent on the user's training objectives and the facilities' terrain.

#### 3.4. SITE AND LANDSCAPE REQUIREMENTS

Site design requirements are identified in the Design Volume. Special attention must be given to the Line-of-Sight (LOS) validation, the Surface Danger Zone (SDZ) verification and site drainage issues. Provide the LOS validation and SDZ verification in the design package.

#### 3.5. ARCHITECTURAL REQUIREMENTS

- A. Architectural design requirements are identified in the Design Volume.
- B. Coordinate with the installation's Public Works office for the exterior and interior color finishes if not specified in the RFP Appendices.

#### C. <u>SHOOTHOUSE WALL MATERIAL</u>

1) <u>Supplied System Qualifications</u>: Provide systems and materials which are the standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been successfully installed in 5 military applications and in satisfactory use for at least 2 years prior to RFP as the main bullet stopping/absorbing wall system.

2) <u>Installation</u>: Install the shoothouse wall material/system as indicated and in accordance with manufacturer's instructions. A manufacturer's representative experienced in installation of this type of facility, shall supervise the erection.

#### 3.5.1. FINISHES AND INTERIOR SPECIALTIES:

- A. <u>FINISHES</u>: Refer to Project Definition Matrix (PDM).
- B. INTERIOR SPECIALTIES: Fire Extinguisher Cabinets and Brackets: Provide Fire Extinguisher cabinets and brackets in all occupied buildings in accordance with NFPA 10 and UFC 3-600-01. Provide cabinets in finished areas and brackets in non-finished areas (such as utility rooms, and storage rooms). Fire extinguishers are not included in this contract.
- 3.6. SEE PARAGRAPH 5.6 STRUCTURAL REQUIREMENTS NOT USED
- 3.7. SEE PARAGRAPH 6.7 THERMAL PERFORMANCE NOT USED
- 3.8. PLUMBING REQUIREMENTS

Water and Sewer service to a range project is a rare occurrence, the remoteness of most ranges from the Installation's existing infrastructure makes their use impractical. However, if water or sewer hookup is specified in the Project Definition Matrix, refer to Paragraph 6 and Appendix C for utility connection information.

#### 3.9. COMMUNICATIONS AND SECURITY SYSTEMS

#### A. GENERAL:

- 1) If telephone service is included in the Scope of this project, coordination with the local NEC is required to ensure Installation compatibility and acceptance. Refer to Paragraph 6 of this section and Appendix C for utility connection information.
- 2) There shall be a clear delineation between the down range communications infrastructure and the facility telecommunication infrastructure. Each communication system enters the ROC Tower, but shall be terminated and housed in separate enclosures and backboards. The downrange communications infrastructure shall be installed in accordance with the Design Volume and the facility telecommunications infrastructure shall be installed in accordance with I3A.

#### 3.10. ELECTRICAL REQUIREMENTS

#### A. GENERAL:

- 1) Refer to Paragraph 6 of this Section and Appendix C for utility connection information.
- 2) The Design Volume contains design submittal and construction submittal requirements that are in addition to those identified by Section 01 33 16 Design After Award and Section 01 78 02.00 10 Closeout Submittals. Project submittal register shall specifically include all submittals required by the Design Volume.
- B. <u>POWER</u>: Provide power to the facilities and downrange area as specified below; all IEEE Standards (including Recommended Practice) where the scope is applicable to this design effort; all UL Standards where the UL scope is applicable to this design effort and where itemized in the combined interdisciplinary areas cited.
- 1) Provide the downrange power and data communications systems in accordance with CEHNC 1110-1-23 Live Fire Exercise Shoothouse (LFSH) Design Volume.

- 2) Perform a short circuit study as an integral part of selecting and sizing electrical distribution components (all equipment shall be fully rated; that is, do not use series-combination rated equipment).
- 3) For Ranges being provided power through Government owned utility systems, perform a coordination study to ensure that protective device settings are appropriate for the expected range of conditions (depending on the design and construction schedule, it is acceptable to design adequate protective devices with adjustable features, followed by a coordination study required during construction to specify the correct settings.)
- 4) Circuit breakers, disconnect switches, and other devices that meet the OSHA definition of energy-isolating device must be lockable.
- 5) Allowable Facility Voltage Drop: For transformer located exterior to the facility, limit the combined voltage drop for service conductors, feeders, and branch circuits to 5 percent. Individual voltage drop on branch circuits should not exceed 3 percent.
- 6) Allowable Downrange Voltage Drop: Voltage available to each target shall be no less than 95 percent of the target's rated operating voltage.
- 7) Medium voltage (MV) surge arrestors shall be provided on all riser poles, within each MV sectionalizer enclosures, within each pad mounted transformer, and wherever the medium voltage rises above grade.
- C. <u>NIGHT OPERATIONS LIGHTING</u>: Where separate switching standard and red lighting is required, identify each switch with a label and provide the standard lighting switch with a locking tab that will permit the standard lighting to be locked "off" during night operations.
- 3.11. HEATING VENTILATING AND AIR CONDITIONING (HVAC) REQUIREMENTS

Heating, Ventilating and Air Conditioning (HVAC) requirements are identified in the Design Volume. HVAC requirements are addressed on a building-by-building basis.

3.12. ENERGY CONSERVATION REQUIREMENTS

Refer to paragraph 5.9 and paragraph 6.12 for energy conservation requirements.

3.13. FIRE PROTECTION REQUIREMENTS

Fire detection and alarm systems are seldom used in Army training ranges due to the low volume of personnel in any facility at any given time. If the project dictates a fire detection and/or a response system, coordinate directly with the Installation's Fire Department for specific requirements. Refer to Paragraph 6 of this section for installation requirements.

- 3.14. SEE PARAGRAPHS 5.12 AND 6.14 SUSTAINABLE DESIGN NOT USED
- 3.15. SEE PARAGRAPH 6.15 ENVIRONMENTAL NOT USED
- 3.16. SEE PARAGRAPH 6.16 PERMITS NOT USED
- 3.17. SEE PARAGRAPH 6.17 DEMOLITION NOT USED`
- 3.18. SEE PARAGRAPH 6.18 ADDITIONAL FACILITIES NOT USED
- 3.19. EQUIPMENT AND FURNITURE REQUIREMENTS

Furnishings, other than installed equipment, are Government-furnished and Government-installed (GFGI) unless otherwise specified in this document.

#### 3.19.1. FURNISHINGS - NOT USED

#### 3.19.2. EQUIPMENT - NOT USED

Targetry and Targetry Control Equipment GFGI unless otherwise specified in this document.

#### 3.20. FACILITY SPECIFIC REFERENCES

- A. In addition to submittals specified in other parts of this RFP, submit the following:
- B. Design Submittals:
- 1) Line of Site profiles from:
- a) Each firing position to their associated targets
- b) Each firing position to the Lane Markers and Range Limit markers.
- 2) Emplacement details both Civil and Electrical
- 3) Complete riser diagram indicating routing of data cables
- 4) Voltage drop calculations
- C. Construction Submittals: Complete riser diagram indicating as-built routing of data cables.

# LIVE FIRE EXERCISE SHOOTHOUSE (LFSH) PROJECT DEFINITION MATRIX

#### An "X" indicates selections

General Project Information		
Х	No Known Environmental Issues on the Project Site	
	Environmental Issues Potentially on Project Site – addressed in more detail in Paragraph 6 and appendices.	
Х	No Known Evidence of Unexploded Ordnance (UXO) on the Project Site	
	Unexploded Ordnance (UXO) Potentially on Project Site – UXO awareness instruction required for all site employees	
Х	ADA and ABA Accessibility Guidelines do not apply to this project	
	Constructive Anti-Terrorism/Force Protection (ATFP) measures are required for this project.	

Down	Downrange Area (Training Facility)	
A.	Configuration	
X	Standard - 8 Rooms, 2 Hallways	
	Non-Standard:	
	Rooms	
	Hallways	
X	Lighting Protection	
B.	B. Wall Material	
	Shock Absorbing Concrete (SACONS)	
X	Manufactured Steel and Rubber System	
	Sand Filled	
C.	Canopy	
Х	Open Sided Pre-Manufactured Building	
	Partial Walls -	
	Wall configuration specified in Paragraph 6	

Downrange Area (Training Facility)	
	Ballistic Ceiling -
	Ceiling configuration specified in Paragraph 6
	Other
D. Target, Camera and Speaker Power and Control	
X	Hardwired Electricity and Data
	Hardwired Electricity and RF/WiFi Data (provided under separate contract)
	Battery and RF/WiFi Data (power and data provided under separate contract)
	Other:

Range Operations and Control Area (ROCA)		
1	After Action Review - Small Standard size: 1064 SQ FT, 34' x 28' enclosed	
A. (	A. Construction	
	D/B Contractors Discretion	
Х	Concrete Masonry Unit (CMU)	
	Metal	
	Other:	
В. Е	Building Infrastructure and Features	
X	Electrical Service	
X	Day and night operations lighting	
X	Lightning protection	
X	Public Address (PA) System	
Х	Hardwired Command & Control Data Service-Downrange Data	
Х	Telephone Service: Fiber, see App C for connection point	

Ra	Range Operations and Control Area (ROCA)		
Χ		Fire Extinguisher Cabinets or Brackets	
		Fire Detection & Alarm (connected to Installation Emergency Services)	
	C. I	HVAC	
		Power Source: See appendix C for infrastructure connection point	
Х		Both heat and air conditioning	
		Heat only	
		Freeze protection only	
		Ventilation only	
	D. (	Other	
		Due to the differing occupancies and environmental requirements in the AAR, the D-B Contractor shall provide separate HVAC units for the AAR Development and the Classroom.	
1		Operations Storage Building Standard Size: 20 ft x 40 ft – 800 SQ FT	
	Α. (	Construction	
		D/B Contractors Discretion	
Х		Concrete Masonry Unit (CMU)	
		Metal	
		Other:	
	В. Е	Building Infrastructure and Features	
Х		Electrical Service	
Х		Day and night operations lighting	
Х		Lightning protection	
Х		Data Service - Internet	
Х		Telephone Service: Copper connection to AAR	
Х		Fire Extinguisher Cabinets or Brackets	
		Fire Detection & Alarm (connected to Installation Emergency Services)	

Ra	Range Operations and Control Area (ROCA)	
	C. HVAC	
		Power Source: See Appendix C for infrastructure connection point
Х		Both heat and air conditioning
		Heat only
		Freeze protection only
		Ventilation only
	D.	Other
1		Ammunition Breakdown Building Standard Size: 185 SQ FT, 10' x 12' enclosed
		A. Construction
		D/B Contractors Discretion
Х		Concrete Masonry Unit (CMU)
		Metal
		Other:
		B. Building Infrastructure and Features
Х		Electrical Service
Х		Day and night operations lighting
Х		Lightning protection
Х		Fire Extinguisher Cabinets or Brackets
		Fire Detection & Alarm (connected to Installation Emergency Services)
	C. HVAC	
Po	wer :	Source:
		Both heat and air conditioning
		Heat only
		Freeze protection only

Range Operations and Control Area (ROCA)	
Х	Ventilation only
	D. Other
1	Latrine
х	Aerated Vault Latrine Standard Size: 330 SQ FT, 26' x 12'-8"
	Wet Latrine – Septic Field Standard Size: 550 SQ FT, 22' x 25'
	Wet Latrine – Sewage System Standard Size: 550 SQ FT, 22' x 25'
	Other:
	Port-A-John Slab
A.	Construction
	D/B Contractors Discretion
Х	Concrete Masonry Unit (CMU)
	Metal
	Other:
B.	Building Infrastructure and Features
Х	Electrical Service
Х	Day and night operations lighting
	Lightning protection
	Water Supply: Linear feet to source:
	Water Supply - Well
	Sewage Hookup:

Range	Range Operations and Control Area (ROCA)	
	Linear feet to tie in: [Not Supplied - LfshRocaLatrine : LFSH_LAT_BI_LF2TI]	
X	Fire Extinguisher Cabinets or Brackets	
	Fire Detection & Alarm (connected to Installation Emergency Services)	
C.	HVAC	
Power 9	Source: See Appendix C for infrastructure connection point	
	Both heat and air conditioning	
	Heat only	
	Freeze protection only	
X	Ventilation only	
D.	Other	
1	Non-Standard Building: Courtyard Wall	
	Size:	
A. Construction		
	D/B Contractors Discretion	
X	Concrete Masonry Unit (CMU)	
	Metal	
	Other:	
B.	Building Infrastructure and Features	
	Electrical Service	
	Day and night operations lighting	
	Lightning protection	
	Public Address (PA) System	
	Data Service - Internet	
	Telephone Service: :	
	Water Supply:	
	Linear feet to source:	

Range Operations and Control Area (ROCA)	
	Water Supply - Well
	Sewage Hookup:
	Linear feet to tie in:
	Fire Extinguisher Cabinets or Brackets
	Fire Detection & Alarm (connected to Installation Emergency Services)
C. H	IVAC
F	Power Source:
	Both heat and air conditioning
	Heat only
	Freeze protection only
	Ventilation only
D. Other	
	**(AM #0003)** Courtyard wall shall be 8 ft tall with two vehicular entry points and
	breaching points. The wall shall be placed 20 feet away from the Shoothouse all the way around the building.
	breaching points. The wall shall be placed 20 feet away from the Shoothouse all the way

Each submittal will require three week review time. The data on the CD should include drawings (PDF or CAL), specs, calculations, and design analysis so the entire package can be reviewed.

#### All project types

U.S. Army Engineering and Support Center, Huntsville (HNC)

ATTN: CEHNC-ISP-MI (Stephenson)

4820 University Square Huntsville, AL 35816-1822 Telephone: 256-895-1534

E-mail: william.c.stephenson@.usace.army.mil

Submittals: 4 Drawing sets (half size), 1 Specs, 1 Calc, 1 Design Analysis & 2

CDs for all review

U.S. Army Information Systems Engineering Command

ATTN: MCA/Construction (Mr. Rickey Smith)

1435 Porter Street

Fort Detrick, MD 21793

(301) 619-6226

Email: Rickey.smithsr@us.army.mil; George.gaffney@us.army.mil;

deb.bonebrake@us.army.mil Submittals: 2 CDs for all reviews

#### All Range projects

U.S. Army Environmental Command

Environmental Planning Branch (Attn: Jill Reilly-Hauck)

1835 Army Boulevard, BSMT (Bldg 2000)

Fort Sam Houston, TX 78234-2686

Tel No-Email:

Submittals: 1 CD for all reviews

#### Send to the following organizations per Range Classification

#### **Urban Operations Ranges:**

U.S. Army Training Support Center (ATSC) ATTN: TCM- L, Range Mod (Wayne Kerry)

Bldg 2787 Harrison Loop Fort Eustis, VA 23604 Telephone: 757-878-2320

E-mail: Robert.Kerry@us.army.mil

Submittals: 2 Drawing sets (half size) & 2 CDs for all reviews

Simulation, Training, and Instrumentation ATTN: PM-TRADE (Dave Stewart)

12350 Research Parkway

Orlando, FL 32826-3276 Telephone: 407-384-XXXX

Email: Dave.stewart1@us.army.mil

Submittals: 2 Drawing sets (half size) & 2 CDs for all reviews

**IMCOM and ACOM:** provide 1 CD (PDF) and 1 drawing set (half size) per submittal.

#### **IMCOM:**

HQ Installation Management Command IMCOM G-7 (IMOP-T), Sustainable Range Program 11711 North I35, Suite 110, Cube U-23 San Antonio, TX 78233-5498

Office:210-424-8507

E-Mail: bob.wilson2@us.army.mil or daniel.lee.smith@us.army.mil

Submittals: 1 CD (PDF) per submittal.

**ACOM:** Contact HNC representative for ACOM distribution information.

#### 4.0 APPLICABLE CRITERIA

Section: 01 10 00

Unless a specific document version or date is indicated, use criteria from the most current references, including any applicable addenda, unless otherwise stated in the contract or task order, as of the date of the Contractor's latest accepted proposal or date of issue of the contract or task order solicitation, whichever is later. In the event of conflict between References and/or Applicable Military Criteria, apply the most stringent requirement, unless otherwise specifically noted in the contract or task order.

#### 4.1. INDUSTRY CRITERIA

Applicable design and construction criteria references are listed in Table 1 below. This list is not intended to include all criteria that may apply or to restrict design and construction to only those references listed. See also Paragraph 3 for additional facility-specific applicable criteria.

**Table 1: Industry Criteria** 

Air Conditioning and Refrigeration Institute (ARI)			
ARI 310/380	Packaged Terminal Air-Conditioners and Heat Pumps		
ARI 440	Room Fan-Coil and Unit Ventilator		
ANSI/ARI 430-99	Central Station Air Handling Units		
ARI 445	Room Air-Induction Units		
ARI 880	Air Terminals		
Air Movement and C	Air Movement and Control Association (AMCA)		
AMCA 210	Laboratory Methods of Testing Fans for Rating		
American Architect	ural Manufacturers Association (AAMA)		
AAMA 605	Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels		
AAMA 607.1	Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum		
AAMA 1503	Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections		
American Association of State Highway and Transportation Officials (AASHTO)			

	Roadside Design Guide [guardrails, roadside safety devices]		
	Standard Specifications for Transportation Materials and Methods of Sampling and Testing [Road Construction Materials]		
	Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals		
	Guide for Design of Pavement Structures, Volumes 1 and 2 [pavement design guide]		
	A Policy of Geometric Design of Highways and Streets		
American Bearing M	anufacturers Association (AFBMA)		
AFBMA Std. 9	Load Ratings and Fatigue Life for Ball Bearings		
AFBMA Std. 11	Load Ratings and Fatigue Life for Roller Bearings		
American Boiler Ma	nufacturers Association (ABMA)		
ABMA ISEI	Industry Standards and Engineering Information		
American Concrete	Institute		
ACI 302.2R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials		
ACI 318	Building Code Requirements for Structural Concrete		
ACI SP-66	ACI Detailing Manual		
ACI 530	Building Code Requirements for Masonry Structures		
ADA Standards for Accessible Design			
See US Access Board	ADA and ABA Accessibility Guidelines for Buildings and Facilities, Chapters 3-10.		
American Institute of Steel Construction (AISC)			

Manual of Steel Construction – 13th Edition (or latest version)

Section:	01	10	00
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American Iron and Steel Institute		
AISI S100	North American Specification for the Design of Cold-Formed Steel Structural Members	
American Nationa	al Standards Institute 11 (ANSI)	
ANSI Z21.10.1	Gas Water Heaters Vol. 1, Storage water Heaters with Input Ratings of 75,000 Btu per Hour or less	
ANSI Z124.3	American National Standard for Plastic Lavatories	
ANSI Z124.6	Plastic Sinks	
ANSI Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances	
ANSI/IEEE C2	National Electrical Safety Code	
ANSI/AF&PA NDS	National Design Specification for Wood Construction	
American Society	of Civil Engineers (ASCE)	
ASCE 7	Minimum Design Loads for Buildings and Other Structures	
ASCE 77	Manual of Practice No. 77, Design and Construction of Urban Stormwater Management Systems	
ASCE 60	Gravity Sanitary Sewer Design and Construction (ASCE Manuals and Reports on Engineering Practice No. 60)	
ASCE/SEI 31-03	Seismic Evaluation of Existing Buildings [Existing Building Alteration/Renovation]	
ASCE/SEI 41-06	Seismic Rehabilitation of Existing Buildings [Existing Building Alteration/Renovation]	
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)		
ASHRAE 90.1	ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings	
ASHRAE Guideline 0	The Commissioning Process	

ASHRAE Guideline 1.1 The HVAC Commissioning Process			
ASHRAE Handbooks	Fundamentals, HVAC Applications, Systems and Equipment, Refrigeration (Applicable, except as otherwise specified)		
ASHRAE Standard 15	Safety Standard for Refrigeration Systems		
ASHRAE Standard 62.1	Ventilation for Acceptable Indoor Air Quality		
ASHRAE Standard 55	Thermal Environmental Conditions for Human Occupancy (Design portion is applicable, except where precluded by other project requirements.)		
ASHRAE Standard 189.1- 2009	Standard for the Design of High-Performance Green Buildings (ANSI Approved; USGBC and IES Co-sponsored), - (APPLICABLE TO THE EXTENT SPECIFICALLY CALLED OUT IN THE CONTRACT)		
American Society of	Mechanical Engineers International (ASME)		
ASME BPVC SEC VII	Boiler and Pressure Vessel Code: Section VII Recommended Guidelines for the Care of Power Boilers		
ASME A17.1	Safety Code for Elevators and Escalators		
ASME B 31 (Series)	Piping Codes		
American Water Wor	American Water Works Association (AWWA)		
	Standards [standards for water line materials and construction]		
American Welding So	American Welding Society		
	Welding Handbook		
	Welding Codes and Specifications (as applicable to application, see International Building Code for example)		
Architectural Woodw	ork Institute (AWI)		
Latest Version	AWI Quality Standards		
Associated Air Balance Council (AABC)			

Section:	01	10	00

AABC MN-1	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems		
	AABC Associated Air Balance Council Testing and Balance Procedures		
ASTM Internation	onal		
ASTM C1060-90(	Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings		
ASTM E 779	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization		
ASTM E1827-96	Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door		
Builders Hardwa	are Manufacturers Association (BHMA)		
ANSI/BHMA	The Various BHMA American National Standards		
Building Industr	Building Industry Consulting Service International		
	Telecommunications Distribution Methods Manual (TDMM)		
	Customer-Owned Outside Plant Design Manual (CO-OSP)		
Code of Federal	Regulations (CFR)		
49 CFR 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards		
10 CFR 430	Energy Conservation Program for Consumer Products		
Consumer Elect	ronics Association		
CEA 709.1B	Control Network Protocol Specification		
CEA 709.3	Free-Topology Twisted-Pair Channel Specification		
CEA 852	Tunneling Component Network Protocols Over Internet Protocol Channels		
Electronic Industries Association (EIA)			

Section:	01	10	00
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ANSI/EIA/TIA 568	Structured Cabling Series	
ANSI/EIA/TIA 569	Commercial Building Standard for Telecommunications Pathways and Spaces (includes ADDENDA)	
ANSI/TIA/EIA-606	Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings	
J-STD EIA/TIA 607	Commercial Building Grounding and Bonding Requirements for Telecommunications	
Federal Highway Ad	Iministration (FHWA)	
	Manual on Uniform Traffic Control Devices for Streets and Highways [signage and pavement markings for streets and highways]	
FHWA-NHI-01-021	Hydraulic Engineering Circular No. 22, Second Edition, URBAN DRAINAGE DESIGN MANUAL	
Illuminating Engine	ering Society of North America (IESNA)	
IESNA RP-1	Office Lighting	
IESNA RP-8	Roadway Lighting	
IESNA Lighting Handbook	Reference and Application	
Institute of Electrica	al and Electronics Engineers Inc. (IEEE)	
	Standard for Use of the International System of Units (SI): the Modern Metric System	
Standard 1100	Recommended Practice for Powering and Grounding Sensitive Electronic Equipment	
International Code Council (ICC)		
IBC 2009	International Building Code	
	Note: All references in the International Building Code to the International Electrical Code shall be considered to be references to NFPA 70.	
	All references in the International Building Code to the International Fuel Gas Code shall be considered to be references to NFPA 54 and	

Section: 01 10 00	W912QR-23413770 CERTIFIED FINAL-003 Page 62 of 947	
	NFPA 58.	
	All references in the International Building Code to the International Fire Code and Chapter 9 shall be considered to be references to Unified Facilities Criteria (UFC) 3-600-01.	
IMC	International Mechanical Code –	
	Note: For all references to "HEATING AND COOLING LOAD CALCULATIONS", follow ASHRAE 90.1	
	Note: For all references to "VENTILATION", follow ASHRAE 62.1	
IRC	International Residential Code	
IPC	International Plumbing Code	
IEC	Energy Conservation Code (IEC) –Applicable only to the extent specifically referenced herein. Refer to Paragraph 5, ENERGY CONSERVATION requirements.	
IGC	International Gas Code - not applicable. Follow NFPA 54, National Fuel Gas Code and NFPA 58, Liquified Petroleum Gas Code.	
International Organization for Standardization (ISO)		
ISO 6781:1983	Qualitative detection of thermal irregularities in building envelopes – infrared method	
LonMark Internationa	al (LonMark)	

# LonMark International (Lonwark) LonMark Interoperability Guidelines (available at www.lonmark.org), including: Application Layer Guidelines, Layer 1-6 Guidelines, and External Interface File (XIF) Reference Guide LonMark Resource Files (available at www.lonmark.org), including Standard Network Variable Type (SNVT) definitions

# Metal Building Manufacturers Association (MBMA) Metal Building Systems Manual

## Midwest Insulation Contractors Association (MICA)

National Commercial and Industrial Insulation Standards Manual

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National Association of Corrosion Engineers International (NACE)		
NACE RP0169	Control of External Corrosion on Underground or Submerged Metallic Piping Systems	
NACE RP0185	Extruded, Polyolefin Resin Coating Systems with Adhesives for Underground or Submerged Pipe	
NACE RP0285	Corrosion Control of Underground Storage Tank Systems by Cathodic Protection	
NACE RP0286	Electrical Isolation of Cathodically Protected Pipelines	
National Electric	al Manufacturers Association (NEMA)	
National Environ	mental Balancing Bureau (NEBB)	
	Procedural Standards Procedural Standards for Testing Adjusting Balancing of Environmental Systems	
National Fire Pro	tection Association (NFPA)	
NFPA 10	Standard for Portable Fire Extinguishers	
NFPA 13	Installation of Sprinkler Systems	
NFPA 13R	Residential Occupancies up to and Including Four Stories in Height Sprinkler Systems	
NFPA 14	Standard for the Installation of Standpipes and Hose Systems	
NFPA 20	Installation of Centrifugal Fire Pumps	
NFPA 24 NFPA 25	Standard for the Installation of Private Fire Service Mains and Their Appurtenances [underground fire protection system design]  Inspection, Testing And Maintenance Of Water-Based Fire Protection Systems	
NFPA 30	Flammable and Combustible Liquids Code	
NFPA 30A	Motor Fuel Dispensing Facilities and Repair Garages	
NFPA 31	Installation of Oil Burning Equipment	

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NEDA EA			
NFPA 54	National Fuel Gas Code		
NFPA 58	Liquefied Petroleum Gas Code		
NFPA 70	National Electrical Code		
NFPA 70E	Standard for Electrical Safety in the Workplace		
NFPA 72	National Fire Alarm Code		
NFPA 76	Fire Protection of Telecommunications Facilities		
NFPA 80	Standard for Fire Doors and Fire Windows		
NFPA 90a	Installation of Air Conditioning and Ventilating Systems		
NFPA 96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations		
NFPA 101	Life Safety Code		
NFPA 780	Standard for the Installation of Lightning Protection Systems		
National Roofing Contractor's Association (NRCA)			
	Roofing and Waterproofing Manual		
National Sanitation F	National Sanitation Foundation, International		
NSF/ANSI Std. 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 20, 21, 25, 29, 35, 36, 37, 51, 52, 59, 169	Food Equipment Standards		
ANSI/UL Std. 73, 197, 471, 621, 763	Food Equipment Standards		
CSA Std. C22.2 No. 109, 120, 195	Food Equipment Standards		
Occupational Safety and Health Administration (OSHA)			
Title 29, Part 1926	OSHA Construction Industry Standards, Title 29, Code of Federal		

	Regulations, Part 1926, Safety and Health Regulations for Construction
Plumbing and Drai	inage Institute (PDI)
PDI G 101	Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
PDI WH201	Water Hammer Arrestors
Precast Concrete I	Institute
PCI Design Handbook	Precast and Prestressed Concrete
Sheet Metal and A	ir Conditioning Contractor's National Association (SMACNA)
SMACNA HVAC Duct Construction Standards	HVAC Duct Construction Standards - Metal and Flexible
SMACNA Architectural Manual	Architectural Sheet Metal Manual
SMACNA HVAC TAB	HVAC Systems - Testing, Adjusting and Balancing
State/Local Regula	ations
	State Department of Transportation Standard Specifications for Highway and Bridge Construction
	Sedimentation and Erosion Control Design Requirements
	Environmental Control Requirements
	Storm Water Management Requirements
Steel Door Institut	e (SDI)
ANSI A250.8/SDI 100	Standard Steel Doors and Frames
Steel Deck Institut	е
	SDI Diaphragm Design Manual
Steel Joist Institut	e ·

	Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders	
Underwriters Laboratories (UL)		
UL 96A	Installation Requirements for Lightning Protection Systems	
UL 300	Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas	
UNITED STATES ACC BARRIERS COMPLIA	ESS BOARD: U.S. ARCHITECTURAL AND TRANSPORTATION NCE BOARD	
ADA and ABA Accessibility Guidelines for Buildings and Facilities	ABA Accessibility Standard for DoD Facilities	
	Derived from the ADA and ABA Accessibility Guidelines: Specifically includes: ABA Chapters 1 and 2 and Chapters 3 through 10.	
	Use this reference in lieu of IBC Chapter 11.	
	Excluded are:	
	(a) Facilities, or portions of facilities, on a military installation that are designed and constructed for use exclusively by able-bodied military personnel (See Paragraph 3 for any reference to this exclusion).	
	(b) Reserve and National Guard facilities, or portions of such facilities, owned by or under the control of the Department of Defense, that are designed and constructed for use exclusively by able-bodied military personnel. (See paragraph 3 for any reference to this exclusion).	
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES		
	FDA National Food Code	

# U.S. GREEN BUILDING COUNCIL (USGBC)

	,
LEED-NC	Green Building Rating System for New Construction & Major Renovations
	Application Guide for Multiple Buildings and On-Campus Building Projects

#### 4.2. MILITARY CRITERIA

Section: 01 10 00

The project shall conform to the following criteria. Certain design impacts and features due to these criteria are noted for the benefit of the offeror. However, all requirements of the referenced criteria will be applicable, whether noted or not, unless otherwise specified herein.

- 4.2.1. Energy Policy Act of 2005 (Public Law 109-58) (applies only to the extent specifically implemented in the contract, which may or may not directly cite or reference EPACT)
- 4.2.2. Energy Independence and Security Act of 2007- "EISA" (applies only to the extent specifically implemented in the contract)
- 4.2.3. Executive Order 12770: Metric Usage In Federal Government
- (a) Metric design and construction is required except when it increases construction cost. Offeror to determine most cost efficient system of measurement to be used for the project.
- 4.2.4. TB MED 530: Occupational and Environmental Health Food Sanitation
- 4.2.5. Unified Facilities Criteria (UFC) 3-410-01FA: Heating, Ventilating, and Air Conditioning applicable only to the extent specified in paragraph 5, herein.
- 4.2.6. UFC 3-101-0 Architectural Design, (Applies only to the extent specifically implemented herein).
- 4.2.7. UFC 3-210-10, Low Impact Development, applicable only to the extent specified herein.
- 4.2.8. UFC 3-600-01 Design: Fire Protection Engineering for Facilities. Use the latest edition of the IBC in coordination with this UFC. Use Chapters 3, 6, 7, 33 and UFC 3-600-01. If any conflict occurs between these Chapters and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence. Use UFC 3-600-01 in lieu of IBC Chapters 4, 8,9,10.
- 4.2.9. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings
- 4.2.10. UFC 4-023-03 Design of Buildings to Resist Progressive Collapse (Use most recent version, regardless of references thereto in other publications)
- (a) Note the option to use tie force method or alternate path design for Occupancy Category II.
- 4.2.11. UFC 4-021-01 Design and O&M: Mass Notification Systems
- 4.2.12. UFC 3-420-01, Plumbing Systems, (Applicable only to the extent specifically implemented herein).
- 4.2.13. Technical Criteria for Installation Information Infrastructure Architecture (I3A)
- (a) Email: <u>DetrickISECI3Aguide@conus.army.mil</u>
- 4.2.14. <u>U.S. Army Information Systems Engineering Command (USAISEC)</u> SECRET Internet Protocol (IP) Router Network (SIPRNET) Technical Implementation Criteria (STIC).. See Paragraph 3 for applicability to specific facility type. May not apply to every facility. This is mandatory criteria for those facilities with SIPRNET.
- 4.2.14.1. Draft Guide Specification for Section 27 05 28 PROTECTIVE DISTRIBUTION SYSTEM (PDS) FOR SIPRNET COMMUNICATIONS SYSTEMS, found at http://mrsi.usace.army.mil/rfp/Shared%20Documents/SECTION\_270528-v3.pdf

#### 5.0 GENERAL TECHNICAL REQUIREMENTS

This paragraph contains technical requirements with general applicability to Army facilities. See also Paragraph 3 for facility type-specific operational, functional and technical requirements. Residential or similar grade finishes and materials are not acceptable for inclusion in these buildings, unless otherwise specifically allowed. References to ASHRAE Standard 189.1 are to ASHRAE Standard 189.1-2009 unless otherwise specified in this Paragraph.

#### 5.1. SITE PLANNING AND DESIGN

- 5.1.1. STANDARDS AND CODES: The site planning and design shall conform to APPLICABLE CRITERIA and to paragraph 6, PROJECT SPECIFIC REQUIREMENTS.
- 5.1.2. SITE SELECTION: Meet the allowable site requirements of ASHRAE Standard 189.1, Section 5.3, Manadatory Provisions, and either Section 5.4, Prescriptive Option, or Section 5.5, Performance Option; and ASHRAE Standard 189.1, Section 10.3.2.1.1, unless otherwise specified by the current Department of Defense Minimum Antiterrorism Standards for Buildings, UFC 4-010-01.
- 5.1.3. SITE PLANNING OBJECTIVES: Group buildings in configurations that create a sense of community and promote pedestrian use. See Paragraph 3 for additional site planning requirements relating to building functions.
- 5.1.3.1. Enclosures and Visual Screens: Provide enclosures and or visual screening devices for Outdoor Utility such as dumpsters, emergency generators, transformers, heating, ventilation, and air conditioning units from streetscape and courtyard views to limit visual impact. Enclosures shall be compatible with the building they serve and accessible by vehicle. The location of dumpsters can have a significant visual impact and should be addressed as part of an overall building design and incorporated in site planning.
- 5.1.3.2. Dumpster Pads: Where included in the project, dumpster pads shall be concrete (minimum of 8 inches thick on 4 inch base course, unless site conditions dictate more conservative requirements) and directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Provide space at dumpster areas for recycling receptacles. Coordinate with Installation on recycling receptacle types, sizes and access requirements and provide space at dumpster areas to accommodate them.
- 5.1.3.3. Vehicular Circulation: Apply design vehicle templates provided by the American Association of State Highway and Transportation Officials (AASHTO) to the site design. The passenger car class includes passenger cars and light trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor-semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Provide vehicle clearances required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Provide required traffic control signage Site entrances and site drive aisles shall maximize spacing between drives, incorporate right-angle turns, and limit points of conflict between traffic. Design Services Drives to restrict access to unauthorized vehicles by removable bollards, gates, or other barriers to meet Anti-Terrorism/Force Protection (ATFP) requirements. Orient service drives to building entrances other than the primary pedestrian entry at the front of the building.
- 5.1.3.4. Emergency Vehicle Access: Provide Emergency Vehicle Access around the facility and shall be in accordance with AT/FP requirements. Maintain a 33-foot clear zone buffer for emergency vehicles, designed to prevent other vehicles from entering the AT/FP standoff to the building.
- 5.1.3.5. Stormwater Management and Low Impact Design: Employ design and construction strategies (Best Management Practices, or BMPs) that reduce stormwater runoff, reduce discharges of polluted

water offsite and maintain or restore predevelopment hydrology with respect to temperature, rate, volume, quality and duration of flow. See "Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act (EISA)" (<a href="https://www.epa.gov/owow/NPS/lid/section438/pdf/final\_sec438\_eisa.pdf">https://www.epa.gov/owow/NPS/lid/section438/pdf/final\_sec438\_eisa.pdf</a>) and Paragraph 6, PROJECT SPECIFIC requirements for additional information. BMPs used to treat runoff must be capable of removing 80% of the average annual postdevelopment total suspended solids (TSS) load based on existing monitoring reports. BMPs are considered to meet these criteria if:

- (a) They are designed in accordance with standards and specifications from a state or local program that has adopted these performance standardsOR
- (b) There exists infield performance monitoring data demonstrating compliance with the criteria. Data must conform to accepted protocol (e.g., Technology Acceptance Reciprocity Partnership [TARP], Washington State Department of Ecology) for BMP monitoring.
- (c) In addition, meet the requirements of ASHRAE Standard 189.1, Section 5.3, and either Section 5.4, Prescriptive Option or Section 5.5 Performance Option for Site Development and UFC 3-210-10. If any of the requirements in this subsection are prohibited by state law, state law shall take precedence but only as to those requirements found to be in conflict.
- 5.1.3.6. Erosion and Sedimentation Control: Meet the requirements of ASHRAE Standard 189.1, Section 10.3.1.3.
- 5.1.4. EXTERIOR SIGNAGE: Provide exterior signage in accordance with Appendix H, Exterior Signage. Provide exterior NO SMOKING signage that conveys building and grounds smoking policy. Meet the requirements of ASHRAE Standard 189.1, Section 8.3.1.4 (a).
- 5.1.5. EXISTING UTILITIES: Base utilities maps and capacities for this site are included as part of this RFP. See paragraph 6 for more detailed information.
- 5.2. SITE ENGINEERING
- 5.2.1. STANDARDS AND CODES: The site engineering shall conform to APPLICABLE CRITERIA.
- 5.2.2. SOILS:
- 5.2.2.1. Subsurface Conditions Report: A report has been prepared to characterize the subsurface conditions at the project site and is appended to these specifications. The report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations. The Contractor's team shall include a licensed geotechnical engineer to interpret the report and develop earthwork and foundation recommendations and design parameters in which to base the contractor's design. If any additional subsurface investigation or laboratory analysis is required to better characterize the site or develop the final design, the Contractor shall perform it under the direction of a licensed geotechnical engineer. There will be no separate payment for the cost of additional tests. If differences between the Contractor's additional subsurface investigation and the government provided soils report or the reasonably expected conditions require material revisions in the design, an equitable adjustment may be made, in accordance with the provisions of the Differing Site Conditions clause. The basis for the adjustment would be the design and construction appropriate for the conditions described in the Government furnished report or the reasonably expected conditions, in comparison with any changes required by material differences in the actual conditions encountered, in accordance with the terms of contract clause Differing Site Conditions.
- 5.2.2.2. Geotechnical Evaluation Report: The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal, as described in Section 01 33 16, *Design After Award*.
- 5.2.3. VEHICLE PAVEMENTS: (as applicable to the project)

- 5.2.3.1. Pavement Requirements: Except in Department of Energy (DOE) Climate Zones 6, 7, and 8, meet ASHRAE Standard 189.1, Section 5.3.2.1. If the project is located in DOE Climate Zones 6.7, or 8, design procedures and materials shall conform to one of the following: 1) the USACE Pavement Transportation Computer Assisted Structural Engineering (PCASE) program, 2) American Association of State Highway and Transportation Officials (AASHTO) or, 3) the applicable state Department of Transportation standards in which the project is located. See Paragraph 5.2.2.2 and Section 01 33 16 for required information for the Contractor's geotechnical evaluation report. The minimum flexible pavement section shall consist of 2 inches of asphalt and 6 inches of base or as required by the pavement design, whichever is greater, unless specifically identified by the Government to be a gravel road. Design roads and parking areas for a life expectance of 25 years with normal maintenance. Parking area for tactical vehicles (as applicable to the project) shall be Portland Cement Concrete (PCC) rigid pavement design. For concrete pavements, submit joint layout plan for review and concurrence. Design pavements for military tracked vehicles (as applicable to the project) IAW USACE PCASE. Traffic estimates for each roadway area will be as shown on the drawings or listed in Section 01 10 00 Paragraph 6.4.4. Pavement markings and traffic signage in all DOE Climate Zones shall comply with the Installation requirements and with the Manual on Uniform Traffic Control Devices. Develop a Transportation Management Plan that meets the requirements of ASHRAE Standard 189.1, Section 10.3.2.4.1.
- 5.2.3.2. Parking Requirements. This subsection is applicable only to parking lots/areas that permit POV parking:
- (a) General Parking Requirements:
- (1) Design POV parking spaces for the type of vehicles anticipated, but shall be a minimum of 9 ft by 18 ft for POVs, except for two wheel vehicles.
- (2) Handicap POV parking. All handicap POV parking lots (where applicable in the facility specific requirements) shall meet the ADA and ABA Accessibility Guidelines for accessible parking spaces.
- (3) All handicap POV parking lots (where applicable in the facility specific requirements) shall meet the ADA and ABA Accessibility Guidelines for accessible parking spaces. Design POV parking spaces for the type of vehicles anticipated, but shall be a minimum of 9 ft by 18 ft for POVs, except for two wheel vehicles.
- (b) Preferred Parking:
- (c) Low-Emitting and Fuel Efficient Vehicles:
- 5.2.3.3. Sidewalks: Design the network of walks throughout the complex (where applicable) to facilitate pedestrian traffic among facilities, and minimize the need to use vehicles. Incorporate sidewalks to enhance the appearance of the site development, while creating a sense of entry at the primary patron entrances to the buildings. Minimum sidewalk requirements are in Paragraph 3, where applicable and/or paragraph 6 and/or site plans, where applicable. In addition, meet the requirements of ASHRAE Standard 189.1, Section 5.3.2.1.
- 5.2.4. CATHODIC PROTECTION: Provide cathodic protection systems for all underground metallic systems and metallic fittings/portions of non-metallic, underground systems, both inside and outside the building 5 foot line that are subject to corrosion. Coordinate final solutions with the installation to insure an approach that is consistent with installation cathodic protection programs.
- 5.2.5. UTILITIES: See Paragraph 6.4.6 for specific information on ownership of utilities and Paragraph 5.9.3.5 below for utility metering requirements.
- 5.2.6. PERMITS: The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

Section: 01 10 00 Page 71 of 947

5.2.7. IRRIGATION: Landscape and irrigation systems, if provided, shall comply with ASHRAE Standard 189.1, Section 6.3, Mandatory Provisions, and either Section 6.4, Prescriptive Option, or Section 6.5. Performance Option. In addition, meet the requirements of ASHRAE Standard 189.1. Standard 10.3.2.

- 5.2.8. EPA WATERSENSE PRODUCTS AND CONTRACTORS: Except where precluded in this Paragraph or by other project requirements, use EPA WaterSense labeled products and irrigation contractors that are certified through a WaterSense labeled program where available.
- COMMISSIONING: Execute total building commissioning practices in order to verify performance of building components and systems and ensure that Owner Project Requirements (OPR) are met. Adopt and follow the requirements of ASHRAE Standard 189.1 Section 10.3.1.2, ASHRAE Guideline 0, ASHRAE Guideline 1.1, LEED Energy and Atmosphere (EA) Prerequisite 1 and LEED EA Credit 3. Do not use the sampling techniques discussed in ASHRAE Guideline 1.1 and in ASHRAE Guideline 0. Commission 100% of the HVAC controls and equipment. Commissioning activities shall be consistent with the Pre-Design Phase, Design Phase, Construction Phase and Occupancy and Operations Phase. Perform and document a post occupancy system monitoring and inspection to review building operation within 12 months after beneficial occupancy. Post occupancy system monitoring and inspection results will be used to verify compliance with the Owner's Project Requirements (OPR), to revise and update the Systems Manual and for completion of the Final Commissioning Report.

5.3.1.

- Plan Development: Meet the requirements for the development of the Maintenance Plan and Service Life Plan in ASHRAE Standard 189.1, Section 10.3.2.
- 5.4. ARCHITECTURE AND INTERIOR DESIGN.
- 5.4.1. STANDARDS AND CODES: The architecture and interior design shall conform to APPLICABLE CRITERIA.
- 5.4.2. GENERAL: Overall architectural goal is to provide a functional, quality, meet expected usable life standards, and visually appealing facility that is a source of pride for the installation and delivered within the available budget and schedule.
- MATERIALS AND RESOURCES: Meet ASHRAE Standard 189.1, Section 9.3, Mandatory Provisions, and either Section 9.4, Prescriptive Option, or Section 9.5, Performance Option.
- 5.4.3.1. Construction and Demolition (C&D) Waste Management: Meet the requirements of ASHRAE Standard 189.1, Section 9.3.1. A waste management plan and waste diversion reports are required, as detailed in Section 01 57 20.00 10, ENVIRONMENTAL PROTECTION.
- 5.4.4. COMPUTATION OF AREAS: See APPENDIX Q of this RFP for how to compute gross and net areas of the facility(ies).
- 5.4.5. BUILDING EXTERIOR: Design buildings to enhance or compliment the visual environment of the Installation and reflect a human scale to the facility. Building entrance should be architecturally defined and easily seen. Exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow locally established architectural themes. Use durable materials that are easy to maintain. Exterior materials colors shall conform to the Installation requirements and if brick or stone, have color that is throughout the material. See Paragraph 6 for project specific requirements.
- 5.4.5.1. Building Numbers: Permanently attach exterior signage on two faces of each building indicating the assigned building number or address. Building number signage details and locations shall conform to Appendix H, Exterior Signage of this RFP.

5.4.5.2. Roofs and Exterior Walls: Meet the requirements of ASHRAE Standard 189.1, Section 5.3,

5.4.5.2. Roofs and Exterior Walls: Meet the requirements of ASHRAE Standard 189.1, Section 5.3, Mandatory Provisions, and Section 5.4, Prescriptive Option, or Section 5.5, Performance Option. In addition, if a green roof is considered for this project, meet the requirements of ASHRAE Standard 6.2, Mandatory Provisions, and Section 6.3, Prescriptive Option, or Section 6.4, Performance Option.

### 5.4.6. BUILDING INTERIOR

Section: 01 10 00

5.4.6.1. Daylighting and Low Emitting Materials: Meet the requirements of ASHRAE Standard 189.1, Section 8.3, Mandatory Provisions, and either Section 8.4, Prescriptive Option, or 8.5, Performance Option. In addition, meet the daylighting requirements of ASHRAE Standard 189.1, Section 7.3, Mandatory Provisions, and either Section 7.4, Prescriptive Option, or Section 7.5, Prescriptive Option.

#### 5.4.6.2. Surfaces and Color:

- (a) Surfaces: Appearance retention is the top priority for building and furniture related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise. In daylit zones, meet the requirements of ASHRAE Standard 189.1 section 8.4.1.
- (b) Color: The color, texture and pattern selections for the finishes of the building shall provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordinate the building colors and finishes for a cohesive design. Select colors appropriate for the building type. Use color, texture and pattern to path or way find through the building. Trendy colors that will become dated shall be limited to non-permanent finishes such as carpet and paint. Select finishes with regards to aesthetics, maintenance, durability, life safety and image. Limit the number of similar colors for each material. Use medium range colors for ceramic and porcelain tile grout help hide soiling. Plastic laminate and solid surface materials shall have patterns that are mottled, flecked or speckled. Coordinate finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms / warning lights, emergency lighting, and other miscellaneous items with the building interior. Match color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) to the ceiling color.
- 5.4.6.3. Builiding Entrance: Meet the requirements of ASHRAE Standard189.1, Section 8.3.1.5.
- 5.4.6.4. Signage: Provide interior signage for overall way finding and life safety requirements. A comprehensive interior plan shall be from one manufacturer. Include the following sign types: (1) Lobby Directory, (2) Directional Signs; (3) Room Identification Signs; (4) Building Service Signs; (5) Regulatory Signs; (6) Official and Unofficial Signs (7) Visual Communication Boards (8) NO SMOKING signage that conveys building smoking policy. Use of emblems or logos may also be incorporated into the signage plan.
- 5.4.6.5. Window Treatment: All exterior windows and interior windows are to receive either blinds, miniblinds or roller shades in a color selected by the architect from the manufacturer's standard range of colors. Color shall compliment building's design theme. Maintain uniformity of treatment color and material to the maximum extent possible within a building. For all other window treatments and accessories (draperies, curtains, lining, sheers, rods, pulls), refer to Attachment A&B.
- 5.4.6.6. Casework: Unless, otherwise specified, all casework for Cabinetry and cases shall be "custom grade", as described in the AWI Quality Standards

## 5.4.7. COMPREHENSIVE INTERIOR DESIGN

5.4.7.1. SID and FF&E: Comprehensive Interior Design includes the integration of a Structural Interior Design (SID) and a Furniture, Fixtures and Equipment (FF&E) design and package. SID requires the design, selection and coordination of interior finish materials that are integral to or attached to the building structure. Completion of a SID involves the selection and specification of applied finishes for the building's interior features including, but not limited to, walls, floors, ceilings, trims, doors, windows,

Section: 01 10 00 Page 73 of 947

window treatments, built-in furnishings and installed equipment, lighting, and signage. The SID package includes finish schedules, finish samples and any supporting interior elevations, details or plans necessary to communicate the building finish design and build out. The SID also provides basic space planning for the anticipated FF&E requirements in conjunction with the functional layout of the building and design issues such as life safety, privacy, acoustics, lighting, ventilation, and accessibility. See Section 01 33 16 for SID design procedures.

5.4.7.2. FF&E Package: The FF&E design and package includes the design, selection, color coordination and of the required furnishing items necessary to meet the functional, operational, sustainability, and aesthetic needs of the facility coordinated with the interior finish materials in the SID. The FF&E package includes the specification, procurement documentation, placement plans, ordering and finish information on all freestanding furnishings and accessories, and a cost estimate. Coordinate the selection of furniture style, function and configuration with the defined requirements. Examples of FF&E items include, but are not limited to workstations, seating, files, tables, beds, wardrobes, draperies and accessories as well as marker boards, tack boards, and presentation screens. Criteria for furniture selection include function and ergonomics, maintenance, durability, sustainability, comfort and cost. See Section 01 33 16 for FFE design procedures.

#### STRUCTURAL DESIGN 5.5.

- 5.5.1. STANDARDS AND CODES: The structural design shall conform to APPLICABLE CRITERIA.
- 5.5.2. GENERAL: The structural system must be compatible with the intended functions and components that allows for future flexibility and reconfigurations of the interior space. Do not locate columns, for instance, in rooms requiring visibility, circulation or open space, including, but not limited to entries, hallways, common areas, classrooms, etc. Select an economical structural system based upon facility size, projected load requirements and local availability of materials and labor. Base the structural design on accurate, site specific geotechnical information and anticipated loads for the building types and geographical location. Consider climate conditions, high humidity, industrial atmosphere, saltwater exposure, or other adverse conditions when selecting the type of cement and admixtures used in concrete, the concrete cover on reinforcing steel, the coatings on structural members, expansion joints, the level of corrosion protection, and the structural systems. Analyze, design and detail each building as a complete structural system. Design structural elements to preclude damage to finishes, partitions and other frangible, non-structural elements to prevent impaired operability of moveable components; and to prevent cladding leakage and roof ponding. Limit deflections of structural members to the allowable of the applicable material standard, e.g., ACI, AISC, Brick Industry Association, etc. When modular units or other pre-fabricated construction is used or combined with stick-built construction, fully coordinate and integrate the overall structural design between the two different or interfacing construction types. If the state that the project is located in requires separate, specific licensing for structural engineers (for instance, such as in Florida, California and others), then the structural engineer designer of record must be registered in that state.
- 5.5.3. LOADS: See Paragraph 3 for facility specific (if applicable) and Paragraph 6 for site and project specific structural loading criteria. Unless otherwise specified in paragraph 6, use Exposure Category C for wind. If not specified, use Category C unless the Designer of Record can satisfactorily justify another Exposure Category in its design analysis based on the facility Master Plan. Submit such exceptions for approval as early as possible and prior to the Interim Design Submittal in Section "Design After Award". Design the ancillary building items, e.g. doors, window jambs and connections, overhead architectural features, systems and equipment bracing, ducting, piping, etc. for gravity, seismic, lateral loads and for the requirements of UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings. Ensure and document that the design of glazed items includes, but is not limited to, the following items under the design loads prescribed in UFC 4-010-01:
- (a) Supporting members of glazed elements, e.g. window jamb, sill, header
- (b) Connections of glazed element to supporting members, e.g. window to header

Section: 01 10 00 Page 74 of 947

- (c) Connections of supporting members to each other, e.g. header to jamb
- (d) Connections of supporting members to structural system, e.g. jamb to foundation.
- 5.5.4. TERMITE TREATMENT AND GREEN CLEANING: (Except Alaska) Provide termite prevention treatment in accordance with Installation and local building code requirements, using licensed chemicals and licensed applicator firm. In all States, meet the requirements of ASHRAE Standard 189.1, Section 10.3.2, regarding the building Green Cleaning Plan.
- 5.6. THERMAL PERFORMANCE
- 5.6.1. STANDARDS AND CODES: Building construction and thermal insulation for mechanical systems shall conform to APPLICABLE CRITERIA.
- 5.6.2. BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT: Design and construct the building envelope for office buildings, office portions of mixed office and open space (e.g., company operations facilities), dining, barracks and instructional/training facilities with a continuous air barrier to control air leakage into, or out of, the conditioned space that shall meet the requirements of ASHRAE Standard 189.1, Section 7.3, Mandatory Provisions, and either Section 7.4, Prescriptive Option, or 7.5, Performance Option. In addition, meet the requirements of ASHRAE Standard 189.1, Sections 10.3.1.4, 10.3.1.5, 10.3.1.6, and 10.3.2 as well as UFC 3-101-0, Section 3-6. Clearly identify all air barrier components of each envelope assembly on construction documents and detail the joints, interconnections and penetrations of the air barrier components. Clearly identify the boundary limits of the building air barriers, and of the zone or zones to be tested for building air tightness on the drawings. The use of painted interior walls is not an acceptable air barrier method.
- 5.6.2.1. Air Barrier: The air barrier must be durable to last the anticipated service life of the assembly. Provide a motorized damper in the closed position and connected to the fire alarm system to open on call and fail in the open position for any fixed open louvers at elevator shafts. Coordinate the motorized elevator hoistway vent damper(s) with the Fire Protection System design in Paragraph 5.10. Ensure that the damper(s) is accessible to facilitate regular inspection and maintenance.
- 5.6.2.2. Thermal Bridge. A Thermal Bridge (or cold bridge) occurs when a thermally conductive material (such as a metal stud, steel frame or concrete beam, slab or column) penetrates or bypasses the exterior insulation system. Design the building envelope to align all insulating elements, ie, the continuous wall insulation, insulated glazing, insulated doors from top of footing to bottom of roof deck. Wrap insulation around roof overhangs. Disconnect window and door sills from interior construction. Utilize thermally broken window and door frames. Provide details to eliminate thermal bridges particularly at floor slabs, roof/wall intersections, steel lintels and relief angles, metal through-wall flashings and at building corners.
- 5.6.2.3. Damper and Control: Close all ventilation or make-up air intakes and exhausts. . etc., when leakage can occur during inactive periods. Atrium smoke exhaust and intakes shall only open when activated per IBC and other applicable Fire Code requirements.
- 5.6.2.4. Garages: Compartmentalize garages under buildings by providing air-tight vestibules at building access points.
- 5.6.2.5. Spaces Under Negative Pressure: Compartmentalize spaces under negative pressure such as boiler rooms and provide make-up air for combustion.
- 5.6.2.6. TESTING, ADJUSTING AND BALANCING: Test and balance air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing Adjusting, and Balancing Bureau (TABB). The prime contractor shall hire the TAB firm directly, not through a subcontractor. Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations

and suggested practices contained in the TAB Standard shall be considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

- 5.6.2.7. Performance Criteria and Substantiation: Test the completed building for air tightness in accordance with UFC 3-101-01, Section 3-6.3. Submit the qualifications and experience of the testing entity for approval. Demonstrate performance of the continuous air barrier for the opaque building envelope by the following tests:
- (a) Air Barrier Quality Control Plan: Develop an Air Barrier Quality Control plan to assure that a competent air barrier inspector/specialist inspects the critical components prior to them being concealed. At a minimum, three onsite inspections are required during construction to assure the completeness of the construction and design.
- (b) Notification of Testing: Notify the Government at least three working days prior to the tests to provide the Government the opportunity to witness the tests. Provide the Government written test results confirming the results of all tests.

#### 5.7. PLUMBING AND WATER CONSUMING EQUIPMENT

- 5.7.1. STANDARDS AND CODES: The plumbing system and water consuming equipment shall conform to APPLICABLE CRITERIA and ASHRAE Standard 189.1, Section 6.3, Mandatory Provisions, and either Section 6.4, Prescriptive Option, or Section 6.5, Performance Option. In addition, meet the requirements of ASHRAE Standard 189.1, Section 10.3.2.
- 5.7.2. PRECAUTIONS FOR EXPANSIVE SOILS: Where expansive soils are present, include design features for underslab piping systems and underground piping serving chillers, cooling towers, etc, to control forces resulting from soil heave. Some possible solutions include, but are not necessarily limited to, features such as flexible expansion joints, slip joints, horizontal offsets with ball joints, or multiple bell and spigot gasketed fittings. For structurally supported slabs, suspend piping from the structure with adequate space provided below the pipe for the anticipated soil movement.
- 5.7.3. HOT WATER SYSTEMS: For hot water heating and supply systems, meet the requirements in UFC 3-420-01 and amendments, and the service water heating requirements of ASHRAE 189.1, Section 7.4.4.
- 5.7.4. SIZING HOT WATER SYSTEMS: Unless otherwise specified or directed in Paragraph 3, design in accordance with ASHRAE Handbook HVAC Applications, Chapter 49, "Service Water Heating," UFC 3-420-01 and amendments, and ASHRAE 189.1, Section 7.4.3. Size and place equipment so that it is easily accessible and removable for repair or replacement.
- 5.7.5. JANITOR CLOSETS: In janitor spaces/room/closets, provide at minimum, a service sink with heavy duty shelf and wall hung mop and broom rack(s).
- 5.7.6. FLOOR DRAINS: As a minimum, provide floor drains in mechanical rooms and areas, janitor spaces/rooms/closets and any other area that requires drainage from fixtures or equipment, drain downs, condensate, as necessary.

- 5.7.7. WATER EFFICIENT PLUMBING FIXTURES: Indoor plumbing fixture equipment shall comply with the following criteria: ASHRAE 189.1, Section 6.3, Mandatory Provisions, and either Section 6.4, Prescriptive Option, or Section 6.5, Performance Option.
- 5.7.7.1. Water Closets (Toilets): ASHRAE 189.1, Sections 6.3.2.1.a and b. requirements for water closets (toilets) shall be as follows: Flushometer valve type: For single flush, maximum flush volume shall be determined in accordance with ASME A112.19.2/CSA B45.1 and shall be 1.28 gal (4.8 L). For dual-flush, the effective flush volume shall be determined in accordance with ASME A112.19.14 and shall be 1.28 gal (4.8 L). Water closets (toilets)—tank-type: Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Tank-Type High-Efficiency Toilet Specification and shall have a maximum flush volume of 1.28 gal (4.8 L).
- 5.7.7.2. URINALS: Non-water urinals shall comply with ASME A112.19.19 (vitreous china) or IAPMO Z124.9 (plastic) as appropriate.
- 5.7.7.3. PUBLIC LAVATORY FAUCETS: Lavatory faucets in a public setting shall have a maximum flow rate of 0.5 gallons per minute and be in accordance with ASME A112.18.1/CSA B125.1.
- 5.7.7.4. PUBLIC METERING SELF-CLOSING FAUCETS: Faucets in a public setting that supply a specific amount of water over a given period shall have a maximum water use of 0.25 gallons per cycle and be in accordance with ASME A112.18.1/CSA B125.1.
- 5.7.7.5. PRIVATE LAVATORY FAUCETS: Faucets in a private setting such as barracks, family housing, or hospitals shall have a maximum flow rate of 1.5 gallons per minute and be in accordance with ASME A112.18.1/CSA B125.1 and shall comply with the performance requirements of the US EPA WaterSense High-Efficiency Lavatory Faucet Specification.
- 5.7.7.6. KITCHEN FAUCETS: Kitchen faucets shall have a maximum flow rate of 2.2 gallons per minute and be in accordance with ASME A112.18.1/CSA B125.1.
- 5.7.7. Cooling Towers: In addition to the requirements of Subsection 5.7.1. above, conduct a one-time potable water analysis, measuring at least the following control parameters, in ppm or mg/l: calcium (Ca); total alkalinity; silica (Si); chloride (CI); and conductivity. Calculate the number of cooling tower cycles by dividing the amount of each parameter in the condenser water by the amount in the potable makeup water. The maximum acceptable levels of the parameters in the condenser water are: Ca (as CaCO<sub>3</sub>) and Total alkalinity 1000 ppm;  $SiO_2-100$  ppm; CI-250 ppm; Conductivity 3500 µS/ml. Limit cooling tower cycles to avoid exceeding maximum values for any of these parameters. AND Complete the following: A system to monitor and control microbiological growth is recommended; Meter the potable makeup water to the cooling tower and blowdown from the cooling; Blowdown must be controlled with a conductivity meter; Report monthly results of the amount of potable water used, microbiological levels, blowdown, and corrosion; On cooling towers, install drift eliminators that achieve minimum efficiencies of 0.2% for counter-flow systems or 0.5% for cross-flow systems.
- 5.7.7.8. Drainage Systems: Do not use engineered vent or Sovent® type drainage systems.
- 5.7.7.9. Pipe Location and Insulation: Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air insulate plumbing piping with a vapor barrier type of insulation to prevent condensation. Do not locate water or drainage piping over electrical wiring or equipment unless adequate protection against water (including condensation) damage is provided. Insulation alone is not adequate protection against condensation. Meet pipe insulation requirements of ASHRAE 189.1, Section 7.4.3.11 and Table C-11 of Normative Appendix C.
- 5.7.7.10. Pipe Protection During Construction: Cover all drain, waste and vent piping to prevent mortar or other debris during such construction activities.

### 5.8. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

- 5.8.1. STANDARDS AND CODES: The electrical systems for all facilities shall conform to APPLICABLE CRITERIA.
- 5.8.2. MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of Underwriters Laboratories (UL) where UL standards are established for those items. Wiring for branch circuits shall be copper. Motors larger than one-half horsepower shall be three phase. All electrical systems shall be pre-wired and fully operational unless otherwise indicated. Wall mounted electrical devices (power receptacles, communication outlets and CATV outlets) shall have matching colors, mounting heights and faceplates.
- 5.8.3. POWER SERVICE: Primary service from the base electrical distribution system to the padmounted transformer and secondary service from the transformer to the building service electrical equipment room shall be underground. See paragraph 6 for additional site electrical requirements.
- 5.8.3.1. Space Capacity: Provide 10% space for future circuit breakers in all panelboards serving residential areas of buildings and 15% spaces in all other panelboards.
- 5.8.4. TELECOMMUNICATION SERVICE: Connect the project's facilities to the Installation telecommunications (voice and data) system through the outside plant (OSP) telecommunications underground infrastructure cabling system per the I3A Criteria. Connect to the OSP cabling system from each facility main cross connect located in the telecommunications room.
- 5.8.5. LIGHTING: Comply with the recommendations of the Illumination Engineering Society (IES) and requirements of EPAct-2005 and Federal Energy Management Program (FEMP) for lighting products.

### 5.8.5.1. Interior Lighting:

- (a) Reflective Surfaces: Coordinate daylighting requirements and interior architectural space surfaces and colors with the lighting systems to provide the most energy-efficient workable combinations.
- (1) Fluorescent Lighting: Fluorescent lighting systems shall utilize NEMA premium electronic ballasts and high performance fluorescent lamps with a Correlated Color Temperature (CCT) of 4100 Kelvin (K) to 5000 K. Linear fluorescent and compact fluorescent lamps shall have a Color Rendering Index (CRI) of ≥ 82. All fluorescent lamps (compact and linear) shall be reclaimed through a process that captures and properly disposes of or recycles the mercury content. Do not use surface mounted luminaires on acoustical tile ceilings. Provide outside each building emergency egress door an un-switched emergency egress luminaire controlled by photocell or astronomical time clock. All other emergency egress luminaires shall be controlled the same as non-emergency luminaires in a shared space during normal (non-emergency) operation.
- (2) Solid-State Lighting: Fixtures shall have a lumen maintenance life expectancy ( $L_{70}$ ) of  $\geq$  36,000 hours, a CRI of  $\geq$  82, and a CCT of 4100 K to 5000 K. Each solid-state fixture model shall be tested in accordance with IES LM-79. Test reports shall verify the fixture performance (lumen output, lumen maintenance, power consumption, efficacy and color) meets or exceeds the fixture manufactures published data. Laboratory testing shall be completed by a National Voluntary Laboratory Accreditation Program laboratory. Provide a five year warranty for fixtures.
- (3) Light Level Tuning: Light level tuning is a closed-loop feedback system that measures the illumination level in a space and dims the luminaires when the measured level exceeds the target level, thereby saving the energy that otherwise would be used to compensate for future light depreciation. Provide a life-cycle cost-benefit analysis (LCCA) of light level tuning for all spaces where the general lighting luminaires are equipped with dimming ballasts or LED drivers. The LCCA shall follow the methodology contained in 10 CFR 436. Provide light level tuning where the LCCA shows it to be life cycle cost effective.

- (4) Lighting Systems and Controls: Lighting systems (including lighting controls, daylighting controls, and lighting power density limits) shall comply with the requirements of Section 7.4.6 of ASHRAE Standard 189.1 and Section 9 of ANSI/ASHRAE/IES 90.1-2007. Lighting designs shall follow the recommended practices of the IES and shall target the recommended illumination levels of the IES.
- (5) Occupancy or Vacancy Sensors: Use occupancy or vacancy sensors to automatically turn off lighting a specified time after all occupants leave the space. The off time shall be user adjustable to 5, 15, or 30 minutes. Selection of the sensor type (single or dual technology, wired or wireless) shall be based on the space configuration, user functionality and life-cycle cost-benefit analysis. Single technology solutions shall incorporate signal processing technology that distinguishes between background noise and actual motion without automatically changing their sensitivity.
- (6) Automated Shading: Automated shading shall be considered in spaces utilizing daylight harvesting to maximize the energy savings of the daylighting system. The shades shall be controlled to reduce glare and unwanted heat gain while still allowing natural light to enter the space. When utilizing automated shading consider the following:
  - i. For ease of use and space aesthetics, incorporate the automated shades with the lighting control system.
  - ii. For maximum energy savings the automated shading system shall predictably position the shades based on a combination of time of day, façade direction, and sky conditions.
  - iii. For maximum design flexibility and ease of installation, shade system should have the capability to address and control each shade individually.
  - iv. The shading system shall have a manual override that allows the occupant to temporarily adjust the shades to any desired position. The system shall revert back to automatic control after a specified period of time.
- (b) Provide a life-cycle cost-benefit analysis (LCCA) of automated shading for all spaces where daylight harvesting is provided. The LCCA shall follow the methodology contained in 10 CFR 436. Provide automated shading where the LCCA shows it to be economical.
- (1) Scene-Based Dimming: Use scene based dimming in multiple-use areas including auditoriums, conference rooms and classrooms. Also provide scene based dimming in dining rooms and gymnasiums with multiple functions. One button preset touch recall shall allow multiple zones of light within a space to go to the appropriate light levels, known as a scene, for a specific task or use. Scene based control shall allow the integration of AV controls, shading/projection screens and lighting to work seamlessly with one button preset touch (i.e. lights dim, projection screen lowers, and shades go down).
- (2) Personal Lighting Control: Personal lighting controls exceeding ASHRAE requirements shall be considered. Personal lighting controls allow users to vary the general light level based on the task at hand. Personal control can be achieved by wall mounted controls (hard wired or wireless), Infrared or Radio Frequency (RF) wireless devices, or via computer. Digital addressable ballasts and light emitting diode (LED) drivers allow the control flexibility of personal dimming of installed lighting on the occupant's work area (i.e. dim the luminaire over their cubicle to the appropriate light level).
- (3) Wireless and Plug-and-Play Controls: Wireless and plug-and-play lighting controls shall be considered for all installations where flexibility is paramount. To avoid interference, wireless products shall communicate in an FCC frequency band that does not allow continuous transmissions.
- (4) Testing Agent: An independent agent with no less than three years experience in testing of complex lighting control systems shall be hired to conduct and certify functional testing of lighting control devices and control systems. The testing agent shall not be directly involved in either the design or construction of the project and shall certify the installed lighting controls meet or exceed all requirements of ASHRAE Standard 189.1, ANSI/ASHRAE/IES Standard 90.1-2007, and all documented performance criteria. The lighting control manufacturer's authorized technical representative may serve as the testing agent. Submit qualifications of the testing agent for approval.
- (5) Manufacturer Support: shall include technical phone support located in the United States. The technical phone support shall be available 24 hours a day, 365 days a year.

- 5.8.5.2. Exterior Lighting Requirements: These requirements apply to exterior lighting illuminating any building, site, property, structure, gate, sign, roadway, parking lot, pathway, sidewalk, landscape, structure, etc. that is owned, operated by, or constructed to be leased to the Department of the Army. This includes all Sustainment, Restoration, and Modernization (SRM) and Military Construction activities within the United States, its territories, and overseas on permanent Active Army installations, Army Reserve Centers, Army National Guard Readiness Facilities, and Armed Forces Reserve Centers, regardless of funds source. See Paragraph 6.9 for site specific information, if any, on exterior lighting systems.
- (a) General: Exterior lighting technology should be selected based on a balance of energy performance and quality of light, while remaining life-cycle cost effective and environmentally responsible. Exterior lighting systems or luminaires selected for use should have demonstrated adherence to quality standards by being recognized by the DesignLights Consortium (reference e), the ENERGY STAR Program, the FEMP or other third-party qualifier appropriate to the technology. Manufacturers should also stand behind their products by providing a Luminaire warranty for at least five years or more. Design teams should carefully consider the occupancy and purpose of the lighting requirements and incorporate energy-saving controls, sensors, and the use of bi-level fixtures to provide exterior lighting levels only as appropriate and only during the hours of night needed. Other energy-saving and lighting quality design considerations include ensuring better uniformity of lighting distribution to required levels to reduce overlighted hotspots and control light trespass outside the area of intended coverage.
- (b) Exterior Lighting Performance by Application: Exterior lighting systems should meet, at a minimum, the better of the standards below in Table 1 or the DLC Product Qualification Criteria (reference e) or current ENERGY STAR qualification or FEMP designation requirements.
- (c) General Exterior Lighting: Typically lighting to provide visibility for security and people moving along established circulation pathways through an illuminated area to or from a destination. Examples include roadways, parking lots, parking structures, sidewalks, tarmacs, service areas, and secondary exits from buildings.
- (d) Architectural Lighting: Lighting in use where exterior spaces are occupied at night for a functional purpose, such as plazas, gas stations, pavilions, or amphitheaters. Also, for use where a higher quality of light is desired, such as building entrances, wall-wash luminaires, illumination of architectural or landscaping features, sculpture, displays, exhibits, flags, gates, primary signage, etc.
- (e) Exceptions: Where a non-white light color is specifically desired by aesthetic design or a color-specific functional requirement (e.g. water feature lighting, entertainment, signal lights, airfield lights, marine wildlife protection, etc.), the CRI and CCT range values indicated may not apply. Specialized lighting, such as lighting for monitoring systems designed to use non-visible spectrum light, are also exempt from the minimum CRI and CCT standards as well. Luminaires primarily powered by on-site renewable energy (e.g. solar and/or wind) are also exempt from the requirements herein.

Table 1 – Minimum Exterior Lighting Performance by Application. These values represent minimum standards and do not supersede higher standards that may also be applicable or specified by design.

Application	Luminaire Efficacy	CRI	Nominal CCT Ranges	Lamp Life
General Exterior Lighting	65	65	3000-5700	50,000
Architectural Lighting	50	75	3500-5000	50,000

Units:

Luminaire Efficacy (with complete fixture load including ballast/driver loads) is in lumens per watt

CRI (Color Rendering Index) is a value without units CCT (Correlated Color Temperature) Range is in Kelvin Temperature Minimum Lamp Life is in Rated Hours per TM-21

- (f) Life-Cycle Cost Analysis (LCCA) and Renewable Energy Opportunities. On-site renewable or alternative energy power system cost over a 25-year life-cycle should be compared to the cost of the conventional grid-connection infrastructure, operation and maintenance costs thereof, proper time-of-use grid energy cost with line losses and price escalation. Renewable or alternative energy systems should be used wherever the payback period less than or equal to the life cycle period. Design team selections and Value Engineering evaluations are to prioritize a reduced total cost of ownership during the full life-cycle period over the first costs of design and construction. The LCCA shall follow the methodology contained in 10 CFR 436.
- (g) Sustainability and Environmental Impact Reduction. To meet the mercury-use reduction intent of EISA 2007 (Reference c) and other sustainability goals, lighting systems should not contain added mercury in excess of 5mg per lamp or 80 picograms per Lumen Hour. Whenever two or more viable lighting technologies are substantially equal in life-cycle cost and performance, preference should be given to the technology with the lowest mercury content per Lumen Hour.
- 5.8.6. TELECOMMUNICATION SYSTEM: Building telecommunications cabling systems (BCS) and OSP telecommunications cabling system shall conform to APPLICABLE CRITERIA, including but not limited to I3A Technical Criteria. An acceptable BCS encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling. Items included under OSP infrastructure encompass, but are not limited to, manhole and duct infrastructure, copper cable, fiber optic cable, cross connects, terminations, cable vaults, and copper and FO entrance cable.
- 5.8.6.1. Testing: Design, install, label and test all telecommunications systems in accordance with the I3A Criteria and ANSI/TIA/EIA 568, 569, and 606 standards. A Building Industry Consulting Services International (BICSI) Registered Communications Distribution Designer (RCDD) with at least 2 yrs related experience shall develop and stamp telecommunications design, and prepare the test plan. See Paragraph 5.9.2.5 for design of environmental systems for Telecommunications Rooms.
- 5.8.6.2. Installation: The installers assigned to the installation of the telecommunications system or any of its components shall be regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. Key personnel; i.e., supervisors and lead installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. In lieu of BICSI certification, supervisors and installers shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.
- 5.8.6.3. End to End Test: Perform a comprehensive end to end test of all circuits to include all copper and fiber optic cables upon completion of the BCS and prior to acceptance of the facility. Provide adequate advanced notification to the COR to allow COR and Installation personnel attendance The BCS circuits include but are not limited to all copper and fiber optic(FO) entrance cables, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, and workstation outlets. Test in accordance with ANSI/EIA/TIA 568 standards. Use test instrumentation that meets or exceeds the standard. Submit the official test report to include test procedures, parameters tested, values, discrepancies and corrective actions in electronic format. Test and accomplish all necessary corrective actions to ensure that the government receives a fully operational, standards based, code compliant telecommunications system.
- 5.8.7. LIGHTNING PROTECTION SYSTEM: Provide a lightning protection system where recommended by the Lightning Risk Assessment of NFPA 780, Annex L.

- 5.9. HEATING, VENTILATING, AND AIR CONDITIONING
- 5.9.1. STANDARDS AND CODES: The HVAC system shall conform to APPLICABLE CRITERIA.
- 5.9.2. DESIGN CONDITIONS:
- 5.9.2.1. Outdoor and Indoor Calculations and Requirements: Indoor design conditions and load calculations shall be in accordance with UFC 3-410-01FA. Outdoor air and exhaust ventilation requirements for indoor air quality shall be in accordance with ASHRAE 62.1-2007. Outdoor design conditions are in UFC 3-410-01FA except that weather data is specified in paragraph 6, rather than at the URL (web link) listed in the UFC.
- 5.9.2.2. Indoor Air Quality: Buildings indoor air quality sytems, thermal comfort, acoustical control, equipment, calculation procedures, construction and start-up shall comply with ASHRAE Standard 189.1, Section 8.3, Mandatory Provisions, and Section 8.4, Prescriptive Option, and either Section 8.5, Performance Option unless otherwise specified in this subsection.
- 5.9.2.3. Outdoor Air Delivery Monitoring: Spaces Ventilated by Mechanical Systems. Reference Sections 7.4.3.2, 8.3.1.2.1, and 10.3.2, of ASHRAE Standard 189.1. A densely occupied space is defined as those spaces with a design occupant density greater than or equal to 25 people per 1000 ft<sup>2</sup> (100m<sup>2</sup>).
- 5.9.2.4. Environmental Tobacco Smoke: a. Smoking shall not be allowed inside the building. Signage stating such shall be posted within 10 ft (3 m) of each building entrance. b. Any exterior designated smoking areas shall be located a minimum of 50 ft (7.5 m) away from *building entrances*, *outdoor air* intakes, and operable windows. c. Section 6.2.9 of ANSI/ASHRAE Standard 62.1 shall not apply.
- 5.9.2.5. High Humidity Areas: Design HVAC systems in geographical areas meeting the definition for high humidity in UFC 3-410-01FA to comply with the special criteria therein for humid areas.
- 5.9.2.6. Controls Maintenance: Locate all equipment so that service, adjustment and replacement of controls or internal components are readily accessible for easy maintenance.
- 5.9.2.7. Environmental Requirements for Telecommunications Rooms and Telecommunications Equipment Rooms, (including SIPRNET ROOMS, where applicable for specific facility type): Comply with ANSI/EIA/TIA 569 (including applicable Addenda). Maintain environmental conditions at the Class 1 and 2 Recommended Operating Environment. Before being introduced into the room, filter and pre-condition outside air to remove particles with the minimum MERV filtration quality shown in the ASHRAE HVAC Applications, Chapter 19. Maintain rooms under positive pressure relative to surrounding spaces. Design computer room air conditioning units specifically for telecommunications room applications. Build and test units in accordance with the requirements of ANSI/ASHRAE Standard 127. A complete air handling system shall provide ventilation, air filtration, cooling and dehumidification, humidification (as determined during the design phase), and heating. The system shall be independent of other facility HVAC systems and shall be required year round.
- 5.9.2.8. Fire dampers: dynamic type with a dynamic rating suitable for the maximum air velocity and pressure differential to which the damper is subjected. Test each fire damper with the air handling and distribution system running.
- 5.9.3 Utility Meters: Measurement devices with remote communication capability shall be provided to collect energy and water consumption data for each energy supply source and water supply source to each facility, including gas, water (potable, reclaimed and rainwater), electricity, and distributed energy that exceeds the thresholds listed in ASHRAE Standard 189.1. Meet the requirements of ASHRAE Standard 189.1, Sections 6.3.3, 7.3.3, 10.3.2 and AR 420-1, Chapter 22. For Government owned utilities, install meters with remote communication capability as well as have a continuous manual reading option. Water meters shall provide daily data and shall record hourly consumption. Gas and electric meters will

also provide demand readings based on consumption over a maximum of any 15 minute period. Configure all meters to transmit to a meter data management system at least daily even if no receiver for the data is currently available at the time of project acceptance. For privatized utilities, coordinate with the privatization utility(ies) for the proper meter base and meter installation. Exception: Renovation or energy projects with programmed costs less than \$200,000 shall incorporate lower-cost energy monitors when cost effective over the life-cycle of the building following the monitoring guidance as detailed in ASHRAE Standard 189.1 Section 7.3.3.

- 5.9.3.1 Data Storage and Retrieval. The meter data management system shall be capable of electronically storing water meter and sub-meter data and creating user reports showing calculated hourly, daily, monthly and annual water consumption for each meter and sub-meter and provide alarming notification capabilities as needed. In addition, verification of meter operation will be conducted at installation.
- 5.9.3.2 Evaporative Cooling Sub-metering: For buildings that use evaporative cooling, cooling tower(s), hot water makeup systems, or automatic landscape irrigation system(s), separate submeters shall be provided for each such application. Water use data shall be collected at each source (e.g. *potable water*, reclaimed water, rainwater) for any source that exceeds the thresholds of: Potable water- 3,800 L/day (1,000 gal/day); Municipally reclaimed water 3,800 L/day (1,000 gal/day); and Alternate sources of water 1,900 L/day (500 gal/day).
- 5.9.3.3 Water Sub-metering: Sub-metering shall also be provided to collect water use data for each of following building subsystems, if they are sized above the threshold levels: Cooling towers Primary flow > 30 L/s (500 gpm); Evaportative Coolers Makeup water > 0.04 L/s (0.6 gpm); Steam and hot water boilers > 50 kW (500,000 Btu/h) input; Irrigated landscape area with controllers > 2500 m2 (25,000 ft2); Any large water using process Consumption > 3,800 L/day (1000 gal/day).
- 5.9.3.4 Outdoor Irrigation: Outdoor irrigation shall have smart controllers that will shut off when rainfall is sensed (ASHRAE Standard 189.1 paragraph 6.3.1.3 (2011 version)). Outdoor irrigation shall be used only to temporarily for plant establishment and shall be removed within a period not to exceed 18 months of installation.
- 5.9.3.5 Energy Metering: Meters with remote metering capability or automatic meter reading (AMR) capability shall be provided to collect energy use data for each supply energy source (e.g. gas, electricity, district steam) to the building that exceed thresholds of: Electrical service > 200 kVA; On-site renewable electric power All systems > 1 kVA (peak); Gas and steam service >300 kW (1,000,000 Btu/h); Geothermal >300 kW (1,000,000 Btu/h0 heating; Solar thermal >10 kW (30,000 Btu/h). Utility company service entrance/interval meters are allowed to be used provided they are configured for automatic meter reading (AMR) capability. Sub-metering with remote metering capability shall be provided to collect energy use data for each subsystem component that meet the following thresholds: Chillers/heat pumps >70 kW (240,000 Btu/h) cooling capacity; Packaged AC units > 70 kW (240,000 Btu/h) cooling; Fans > 15 kW (20 hp); Pumps > 15 kW (20 hp); Cooling towers > 15 kW (20 hp); Boilers and other heating equipment >300 kW (1,000,000 Btu/h) input; General lighting circuits > 100 kVA; Miscellaneous electric loads > 100 kVA).
- 5.9.4 BUILDING AUTOMATION SYSTEM. Provide a Building Automation System consisting of a building control network , and integrate the building control network into the UMCS as specified.

The building control network shall be a single complete non-proprietary Direct Digital Control (DDC) system for control of the heating, ventilating and air conditioning (HVAC) systems as specified herein. The building control network shall be an Open implementation of LonWorks® technology using ANSI/EIA 709.1B as the only communications protocol and use only LonMark Standard Network Variable Types (SNVTs), as defined in the LonMark® Resource Files, for communication between DDC Hardware devices to allow multi-vendor interoperability.

- 5.9.4.1 The building automation system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This includes, but is not limited to the following:
- (a) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.
- (b) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

#### 5.9.4.2 All DDC Hardware shall:

- (a) Be connected to a TP/FT-10 ANSI/EIA 709.3 control network.
- (b) Communicate over the control network via ANSI/EIA 709.1B exclusively.
- (c) Communicate with other DDC hardware using only SNVTs
- (d) Conform to the LonMark® Interoperability Guidelines.
- (e) Be locally powered; link power (over the control network) is not acceptable.
- (f) Be fully configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself to support the application. All settings and parameters used by the application shall be configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself
- (g) Provide input and output SNVTs required to support monitoring and control (including but not limited to scheduling, alarming, trending and overrides) of the application. Required SNVTs include but are not limited to: SNVT outputs for all hardware I/O, SNVT outputs for all setpoints and SNVT inputs for override of setpoints.
- (h) To the greatest extent practical, not rely on the control network to perform the application.
- 5.9.4.3 Controllers shall be Application Specific Controllers whenever an ASC suitable for the application exists. When an ASC suitable for the application does not exist use programmable controllers or multiple application specific controllers.
- 5.9.4.4 Application Specific Controllers shall be LonMark Certified whenever a LonMark Certified ASC suitable for the application exists. For example, VAV controllers must be LonMark certified.
- 5.9.4.5 Application Specific Controllers (ASCs) shall be configurable via an LNS plug-in whenever t an ASC with an LNS plug-in suitable for the application exists.
- 5.9.4.6 Each scheduled system shall accept a network variable of type SNVT\_occupancy and shall use this network variable to determine the occupancy mode. If the system has not received a value to this network variable for more than 60 minutes it shall default to a configured occupancy schedule.
- 5.9.4.7 Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling one and only one package unit.

#### 5.9.4.8 Not Used

5.9.4.9 Perform all necessary actions needed to fully integrate the building control system. These actions include but are not limited to:

- (a) Configure M&C Software functionality including: graphical pages for System Graphic Displays including overrides, alarm handling, scheduling, trends for critical values needing long-term or permanent monitoring via trends, and demand limiting.
- (b) Install IP routers or ANSI/CEA-852 routers as needed to connect the building control network to the UMCS IP network. Routers shall be capable of configuration via DHCP and use of an ANSI/CEA-852 configuration server but shall not rely on these services for configuration. All communication between the UMCS and building networks shall be via the ANSI/CEA-709.1B protocol over the IP network in accordance with ANSI/CEA-852.
- 5.9.4.10 Provide the following to the Government for review prior to acceptance of the system:
- (a) The latest version of all software and user manuals required to program, configure and operate the system.
- (b) Points Schedule drawing that shows every DDC Hardware device. The Points Schedule shall contain the following information as a minimum:
- (1) Device address and NodelD.
- (2) Input and Output SNVTs including SNVT Name, Type and Description.
- (3) Hardware I/O, including Type (AI, AO, BI, BO) and Description.
- (4) Alarm information including alarm limits and SNVT information.
- (5) Supervisory control information including SNVTs for trending and overrides.
- (6) Configuration parameters (for devices without LNS plug-ins) Example Points Schedules are available at <a href="https://eko.usace.army.mil/fa/besc/">https://eko.usace.army.mil/fa/besc/</a>
- (c) Riser diagram of the network showing all network cabling and hardware. Label hardware with ANSI.CEA-709.1 addresses, IP addresses, and network names.
- (d) Control System Schematic diagram and Sequence of Operation for each HVAC system.
- (e) Operation and Maintenance Instructions including procedures for system start-up, operation and shut-down, a routine maintenance checklist, and a qualified service organization list.
- (f) LONWORKS® Network Services (LNS®) database for the completed system.
- (g) Quality Control (QC) checklist (below) completed by the Contractor's Chief Quality Control (QC) Representative

Table 5-1: QC Checklist

#	Description	Initials
1	All DDC Hardware is installed on a TP/FT-10 local control bus.	
2	Communication between DDC Hardware is only via EIA 709.1B using SNVTs. Other protocols	
	and network variables other than SNVTs have not been used.	
თ	All sequences are performed using DDC Hardware.	
4	LNS Database is up-to-date and accurately represents the final installed system	
5	All software has been licensed to the Government	
6	M&C software monitoring displays have been created for all building systems, including all	
	override and display points indicated on Points Schedule drawings.	
7	Final As-built Drawings accurately represent the final installed system.	
8	O&M Instructions have been completed and submitted.	
9	Connections between the UMCS IP network and ANSI/CEA-709.1B building networks are	
	through ANSI/CEA-852 Routers.	
		•
By sig	ning below I verify that all requirements of the contract, including but not limited to the above, been	met.
Signa	cure: Date:	

- 5.9.4.11 Perform a Performance Verification Test (PVT) under Government supervision prior to system acceptance. During the PVT demonstrate that the system performs as specified, including but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.
- 5.9.4.12 Provide a 1 year unconditional warranty on the installed system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition.
- 5.9.4.13 Provide training at the project site on the installed building system, including all commissioned systems and equipment (ASHRAE Standard 189.1, Section 10.3.1.2), . Upon completion of this training each student, using appropriate documentation, should be able to start the system, operate the system, recover the system after a failure, perform routine maintenance and describe the specific hardware, architecture and operation of the system.

## 5.10 ENERGY CONSERVATION

- 5.10.1 ENERGY EFFICIENCY: The building(s), including the envelope(s), HVAC systems, service water heating, power, and lighting systems, shall meet, at a minimum, the Mandatory Provisions in Section 7.3 and either the Prescriptive Option in Section 7.4 or the Performance Option in Section 7.5 of ASHRAE Standard 189.1. ASHRAE 189.1 is the minimum requirement that incorporates by reference the requirements of ASHRAE Standard 90.1-2007 and shall be used as the project baseline for life-cycle cost comparisons. A LCCA is not required on the baseline project. Substantiation requirements are defined in Section 01 33 16, Design After Award and ASHRAE Standard 189.1, Section 10.3.2. Exception 1: The on-site renewable energy systems included in ASHRAE Standard 189.1, Section 7.4.1.1 are not required.
- 5.10.1.1 Minimum Energy Consumption: The building, including the building envelope, HVAC systems, service water heating, power, lighting systems and process and plug loads shall achieve an energy consumption that is a minimum of 30% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2007 and that is life cycle cost effective. Energy calculation methodologies and substantiation requirements are defined in Section 01 33 16, Design After Award. A LCCA is required.

- 5.10.1.2 EISA 2007 Requirement: Design the building to achieve the maximum possible fossil fuelgenerated energy consumption reduction based on the requirements of EISA 2007 Section 433 that is life cycle cost effective. A LCCA is required.
- 5.10.1.3 LCCA: Where a LCCA is required, an incremental LCCA shall be completed for all energy efficiency or conservation features provided in excess of the baseline to ensure the payback period is no greater than the lesser of 40 years or the projected life of the facility. Equipment procurement, fuel, maintenance, repair, replacement, and any other quantifiable benefits and costs are to be included in the LCCA. The LCCA will be documented and made part of the design analysis. The LCCA shall follow the methodology contained in 10 CFR 436.
- 5.10.2 EnergyStar AND FEMP PRODUCTS: The heating, ventilation, and air conditioning shall comply with Section 6 of ANSI/ASHRAE/IESNA 90.1-2007 and Section 7.4.2.1.b of ASHRAE Standard 189.1, including the Normative Appendix C of ASHRAE Standard 189.1 with the following modification: Purchase Energy Star products, except use FEMP designated products where FEMP is applicable to the product type. The term "Energy Star" means a product that is rated for energy efficiency under an Energy Star program. The term "FEMP designated" means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency. For projects located OCONUS the products listed in ASHRAE Standard 189.1, Section 7.4.7, shall have an equipment efficiency that is equivalent or greater than the criteria required to achieve the ENERGY STAR label or meets or exceeds the equivalent of FEMP designated efficiency requirements.
- 5.10.3 SOLAR HOT WATER HEATING: Design and construct all new construction projects with an average daily non-industrial hot water requirement of 50 gallons or more, and located in an area shown on the NREL solar radiation maps (<a href="http://www.nrel.gov.gis.solar.html">http://www.nrel.gov.gis.solar.html</a>) as receiving an annual average of 4kWh/m2/day or more to provide a minimum of 30 percent of the facility's hot water demand by solar water heating. Waste heat harvesting, integrated co-generation systems, or a combination thereof may be used in lieu of solar water heating where they achieve equivalent energy savings, as documented in the project's design analysis and commissioning analysis.
- 5.10.4 WATER USED FOR HEATING AND COOLING: Meet the requirements of ASHRAE 189.1 Section 6.3.2.3 HVAC Systems and Equipment and Section 6.4.2.1 Cooling Towers. When potable water is used to improve a building's energy efficiency, employ life-cycle cost effective water conservation measures per requirements of EPAct 2005 Section 109. This includes potable water used for both domestic and process purposes.
- 5.10.5 RENEWABLE ENERGY: See Paragraph 6, PROJECT SPECIFIC REQUIREMENTS for renewable energy requirements for this project.
- 5.10.6 FUNDAMENTAL REFRIGERANT MANAGEMENT: Meet the requirements of ASHRAE Standard 189.1, Section 9.3.3.
- 5.11 FIRE PROTECTION
- 5.11.2 STANDARDS AND CODES Provide the fire protection system conforming to APPLICABLE CRITERIA.
- 5.11.3 INSPECTION AND TESTING: Inspect and test all fire suppression equipment and systems, fire pumps, fire alarm and detection systems and mass notification systems in accordance with the applicable NFPA standards. The fire protection engineer of record shall witness final tests. The fire protection engineer of record shall certify that the equipment and systems are fully operational and meet the contract requirements. Two weeks prior to each final test, the contractor shall notify, in writing, the installation fire department and the installation public work representative of the test and invite them to witness the test.

- 5.11.4 FIRE EXTINGUISHER CABINETS: Provide fire extinguisher cabinets and locations for hanging portable fire extinguishers in accordance with NFPA 10 Standard for Portable Fire Extinguishers. The Government will furnish and install portable fire extinguishers, which are personal property, not real property installed equipment.
- 5.11.5 FIRE ALARM AND DETECTION SYSTEM: Required fire alarm and detection systems shall be the addressable type. Fire alarm initiating devices, such as smoke detectors, heat detectors and manual pull stations shall be addressable. When the system is in alarm condition, the system shall annunciate the type and location of each alarm initiating device. Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location.
- 5.11.6 ROOF ACCESS: Paragraph 2-9 of UFC 3-600-01 Fire Protection for Facilities will be modified in the next update to that UFC. Pending revision, comply with roof access and stairway requirements in accordance with the International Building Code. Where roof access is required by the IBC or other criteria, comply with UFC 4-010-01, Anti-Terrorist Force Protection, Standard 14. "Roof Access".
- 5.11.7 FIRE PROTECTION ENGINEER QUALIFICATIONS: In accordance with UFC 3-600-01, FIRE PROTECTION ENGINEERING FOR FACILITIES, the fire protection engineer of record shall be a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), or a registered P.E. in a related engineering discipline with a minimum of 5 years experience, dedicated to fire protection engineering that can be verified with documentation.

## 5.12 SUSTAINABLE DESIGN

- 5.12.1 STANDARDS: Sustainable design shall conform to APPLICABLE CRITERIA. See Paragraph 6, PROJECT-SPECIFIC REQUIREMENTS for which version of LEED applies to this project, however, this project shall achieve a minimum of LEED Silver Certification by Green Building Certification Institute (GBCI). Each building must individually comply with the requirements of paragraphs ENERGY CONSERVATION and PLUMBING AND WATER CONSUMING EQUIPMENT. The project must earn the points associated with compliance with paragraph 5.10, ENERGY CONSERVATION, of this RFP.
- 5.12.2 In accordance with the National Defense Appropriations Acto fo 2012, Section 2830, the contractor will not be compensated for any expenses associated with the express intent to obtain LEED certification above the SILVER level. It is recognized that competitive best balue proposal details and requirements cited else where in this document and supporting documents may provide for features which allow for a certification higher than SILVER to be obtained. Whether to achieve a future marketing advantage or for toher purposes, the contractor may obtain LEED GOLD or PLATINUM certification(s) provided that achieving such certification imposes no additional cost to the government.
- 5.12.3 CONSTRUCTION WASTE MANAGEMENT: A minimum of 60% of non hazardous construction and demolition waste material generated prior to the issuance of the final certificate of occupancy shall be diverted from discposal in landfills and incinerators by recycling and/or reuse. Reuse includes donation of materials to charitable organization, salvage of existing materials onsite, and packaging materials returned to the manufacturer, shipper, or other source that will reuse the packaging in future shipments. Excavated soil and land clearing debris shall not be included in the calculation. Calculations are allowed to be done by either weight or volume, but shall be consistent throughout. Specific area(s) on the construction site shall be designated for collection of recyclable and reusable materials. Off-site storage and sorting of materials shall be allowed. Civersion efforts shall be tracked throughout the construction process.
- 5.12.4 LEED INNOVATION AND DESIGN AND REGIONAL PRIORITY CREDITS: LEED Innovation and Design (ID) credits are acceptable only if they are supported by formal written approval by GBCI (either published in USGBC Innovation and Design Credit Catalog or accompanied by a formal ruling from GBCI). LEED ID and RP credits that require any Owner actions or commitments are acceptable only

when Owner commitment is indicated in paragraph PROJECT-SPECIFIC REQUIREMENTS or Appendix LEED Project Credit Guidance.

Section: 01 10 00

- 5.12.5 DOCUMENTATION FOR CERTIFICATION: All LEED Prerequisite and Credit documentation shall be provided to GBCI and the Owner (if requested) in addition to any other documentation requirements. Online documentation shall be uploaded to GBCI and updated at each phase of the project.
- SECURITY (ANTI-TERRORISM STANDARDS): Unless otherwise specified in Project Specific 5.13 Requirements, only the minimum protective measures as specified by the current Department of Defense Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, are required for this project. The element of those standards that has the most significant impact on project planning is providing protection against explosives effects. That protection can either be achieved using conventional construction (including specific window requirements) in conjunction with establishing relatively large standoff distances to parking, roadways, and installation perimeters or through building hardening, which will allow lesser standoff distances. Even with the latter, the minimum standoff distances cannot be encroached upon. These setbacks will establish the maximum buildable area. All standards in Appendix B of UFC 4-010-01 must be followed and as many of the recommendations in Appendix C that can reasonably be accommodated should be included. The facility requirements listed in these specifications assume that the minimum standoff distances can be met, permitting conventional construction. Lesser standoff distances (with specific minimums) are not desired, however can be provided, but will require structural hardening for the building. See Project Specific Requirements for project specific siting constraints. The following list highlights the major points but the detailed requirements as presented in Appendix B of UFC 4-010-01 must be followed.
- (a) Standoff distance from roads, parking and installation perimeter; and/or structural blast mitigation
- (b) Blast resistant windows and skylights, including glazing, frames, anchors, and supports
- (c) Progressive collapse resistance for all facilities 3 stories or higher. Unless determined otherwise by the Installation and noted in paragraphs 3 or 6, the building shall be considered to have areas of uncontrolled public access when designing for progressive collapse.
- (d) Mass notification system (shall also conform to UFC 4-021-01, Mass Notification Systems)
- (e) For facilities with mailrooms (see Paragraph 3 for applicability) mailrooms have separate HVAC systems and are sealed from rest of building

#### 6.0 PROJECT SPECIFIC REQUIREMENTS FORT CAMPBELL, KY

#### 6.1. GENERAL

The requirements of this paragraph augment the requirements indicated in Paragraphs 3 through 5.

#### 6.2. APPROVED DEVIATIONS

# 6.2.1 The following are approved deviations from the requirements stated in Paragraphs 3 through 5 that only apply to this project.

#### 6.2.1.1. DELETED

## 6.2.2 Building Automation System

Perform all necessary actions needed to fully integrate the building control system to the FMCS. The following requirements supersede paragraphs 5.8.3.7 and 5.8.3.9.

- 6.2.2.1 Meter all utilities and include the cost in the contract price.
- (a) Provide and install water meter(s). Coordinate meter purchase, location, and installation with the Privatized Utility, CH2MHill.
- (b) Provide and install gas meter(s). Coordinate meter purchase and installation from Clarksville Gas and Water. CG&W shall install and program the wireless transmitter on each meter (Also include this cost in the contract price.)
- (c) Provide and install wireless electric meter(s) compatible with existing Aclara Data Collection Units. Meters shall be the Aclara Star Network MTU wireless electric meters or an approved equal that functions with the existing system. Provide a working meter including programming of the unit for operation with dedicated server.
- 6.2.2.2 The building automation system (BAS) controls in the facilities under this contract will be integrated to and become part of the Facility Management and Control System (FMCS). Provide Java Application Control Engines (JACE), version R2, within each building or facility. The JACE (version R2) shall connect the BAS in the building or buildings to the FMCS via Fort Campbell's wide area network.
- 6.2.2.3 Access to the BAS shall be available locally in each building, and remotely from personal computers residing on the Fort Campbell network. Accomplish access through standard Web browsers, via the Internet and the Fort Campbell network.
- 6.2.2.4 Each JACE shall communicate with the BAS including the LonMark/LonTalk controllers and other open systems and devices provided in the building. The FMCS is based on the Niagara Framework, a Java-based framework developed by Tridium. Niagara provides an open automation infrastructure that integrates diverse systems and devices regardless of manufacturer into a unified platform that can be easily managed in real time over the Internet using a standard Web browser.
- 6.2.2.5 The JACE shall serve as the interface between the BAS and the FMCS. The JACE may perform BAS data manager functions such as time schedules for equipment, trend logging, and alarm processing and alarm handling functions. However, the JACE shall not perform process control. Process control shall be handled by the Application Specific Controllers and Programmable Controllers included in the BAS.
- 6.2.2.6 Provide graphics for each piece of controlled HVAC equipment and other equipment. The graphics shall include the building floor plan with links to mechanical rooms and all controlled equipment. As a minimum, the graphics shall show the equipment modes, commonly adjusted setpoints, sensed

variables, output commands, and actuator positions for each piece of controlled equipment. The graphics shall be available locally using a laptop service tool, or remotely as described above. Demonstrate the graphic interface and show that all sensed values are accurate, that dynamic screen links work properly, that set points can be changed remotely, and that any input or output variable can be trend logged and graphed. Additionally, perform a JACE failure test using an out-of-the-box test JACE furnished by Fort Campbell. The test JACE will be void of any programming. Demonstrate that the program and database required to make the test JACE operate can be successfully loaded from a service lap top tool, and that the test JACE then operates and functions correctly as a replacement JACE.

- 6.2.2.7 Provide non-expiring licenses for all controllers and software and which require licensing to Fort Campbell.
- 6.2.2.8 The graphics shall be similar to the existing graphics used on the Fort Campbell Facility Management and Control System. Sample FMCS graphic screens are included in the applicable Appendix. The first graphic resides on the server in building 865. Modify this graphic to add the newly connected building or buildings to the graphic.
- 6.2.2.8 Green light means no building alarms.
- 6.2.2.10 Red means building alarms exist.
- 6.2.2.11 Yellow means the building is not communicating.
- 6.3. SITE PLANNING AND DESIGN
- 6.3.1. General:
- 6.3.1.1 Risk of encountering Munitions of Explosive Concern. The construction foot print is considered to be "low" risk for finding MEC. However, this does not eliminate the possibility of encountering MEC at the site. MEC Training is required. Coordinate with Range Control for the required training. In the event that an object resembling military munitions is discovered during construction activities, construction contractor personnel should stop work in the immediate vicinity of the discovery and immediately contact EOD personnel to investigate the item. Should a suspect discovery be confirmed to contain an explosive hazard, EOD personnel will remove or destroy the item, during which the construction contractor personnel will be required to maintain a safe distance from the item as specified by Range Control EOD Personnel. Maximum coordination will be required between the construction contractor and Range Control Personnel. The construction contractor should maintain flexibility in redirecting personnel and work effort, in the event that items possessing an explosive hazard are discovered, away from MEC removal areas during the destruction/removal processes. When work is being performed at sites with a potential MEC issues all work will need to be performed in accordance with EP 75-1-2, August 2004, Munitions and Explosives of Concern (MEC) Support during Hazardous, Toxic and Radioactive Waste (HTRW) and Construction Activities. EP75-1-2 requires site specific planning documents to be generated and reviewed by USACE MM CX for review. These documents are discussed in section 3 Planning Consideration for MEC support. Chapter 6 MEC support during Construction activities should be followed.
- 6.3.2. Site Structures and Amenities
- 6.3.2.1 Refer to Appendix J, Site Plan for dumpster location.

Section: 01 10 00 Page 91 of 947

6.3.2.2 Provide visual screens for dumpster and mechanical equipment in accordance with ATFP requirements. Enclosures shall match the building's architectural theme and finish material.

- Dumpsters Enclosures. Dumpster Enclosures shall be 3-sided and sized to accommodate two (a) dumpsters, each measuring 6 ½-feet x 6 ½-feet. (reference Paragraph 5.1.2.1. for additional information). Provide a concrete loading apron for the first 15-feet in front of the dumpster pad to accommodate loading of dumpsters and avoid rutting on the pavement. Enclosures shall be at least 18-feet wide with the swinging doors mounted on the front of the enclosure, not the inside of the enclosure. If the doors are mounted on the inside wall they will need to be at least 19-feet wide. Swinging doors, gate posts, and bollards shall not reduce the clear opening width.
- Exterior Mechanical Equipment. Enclosures for chillers and cooling towers shall not be more than ten feet high.
- 6.3.3. Site Functional Requirements:
- 6.3.3.1. Stormwater Management (SWM) Systems.
- Design and construct the stormwater drainage system in accordance with Federal Aviation Administration Advisory Circular FAA AC 150-5320-5C, Surface Drainage Design; Federal Highway Administration Publication No. FHWA-NHI-01-021, Hydraulic Engineering Circular No. 22, Second Edition, URBA DRAINAGE DESIGN MANUAL. Base design of drainage structures on a 10-year storm frequency. Design of the storm drainage system shall incorporate the principles of Low Impact Development (LID), as detailed in UFC 3-210-10 DESIGN: LOW IMPACT DEVELOPMENT MANUAL. The design shall maintain or restore to the maximum extent technically feasible, the predevelopment hydrology of the site with regard to temperature, rate, volume, and duration of flow in accordance with Section 438 of the Energy Independence and Security Act of 2007 (EISA 2007). Design the stormwater management facilities in accordance with DoD Policy Memorandum, Office of the Secretary of Defense, DoD Implementation of Storm Water Requirements under Section 438 of the Energy Independence and Security Act (EISA), 19 Jan 10.
- For volume control, an on-site storm water retention/detention system shall be required. Design criteria for storage facilities shall follow the "Fort Campbell Policy for Storm Water Erosion and Sediment Control at Construction Sites" developed by Fort Campbell DPW, as posted on the Fort Campbell Environmental web site (http://www.campbell.army.mil/envdiv/). Take special note of the Precipitation Frequency Estimates and the required Pre-developed curve number included in the policy.
- Development projects over 5000 square feet are required by the 2007 Energy Independence and (c) Security Act, Section 438, to implement strategies to "maintain or restore, to the maximum extent feasible, the predevelopment hydrology of the property with regard to temperature, rate, volume, and or duration of flow." See the USEPA technical guidance at http://www.epa.gov/oaintrnt/documents/epa swm guidance.pdf. In addition, Fort Campbell has a water quality treatment standard for the first flush of 1.1 inches of rainfall.

## 6.3.3.2. Erosion and Sediment Control

- Fort Campbell Environmental Division of Public Works oversees the Stormwater Sediment and Erosion Control Management Plan for the Post. The point of contact for Fort Campbell Environmental Divisions is Dan Etson, (270) 798-8794, dan.etson@us.army.mil.
- Fort Campbell is currently implementing compliance with new five year Phass II MS4 general (b) permits issued by Kentucky and Tennessee in 2010. In order to comply with the provisions of the state and EPA NPDES permits, all construction projects, including those located in the Clarksville Base Development, must comply with the provisions of the "Fort Campbell Policy for Storm Water Erosion and Sediment Control at Construction Sites" developed by Fort Campbell DPW, as posted on the Fort

Campbell Environmental web site (<a href="http://www.campbell.army.mil/envdiv/">http://www.campbell.army.mil/envdiv/</a>). These provisions include the Contractor's preparation of a project specific Storm Water Pollution Prevention Plan (SWPPP), the Contractor signing onto Fort Campbell's general permit Notice to Intent, and enforcement of the plan components. Projects located in the Clarksville Base Development are covered under an Individual NPDES Permit for Construction Activities. The Contractor will be signing onto Fort Campbell's permit. Aggressive EPSC measures are critical. Fort Campbell samples project storm water outfalls using a third party EPSC inspector. See 6.15.2 for additional information.

(c) Be aware of any Wetlands, Sinkholes, or Class V Injection Well that may be associated with this project. Do not discharge any storm water off the installation on to private land owners. Install and maintain all erosion and sediment control devices in accordance with the Fort Campbell Policy for Storm Water Erosion and Sediment Control at Construction Sites.

#### 6.3.3.3. Vehicular Circulation.

- (a) Emergency Vehicle Access. The ground access surface shall accommodate all Fort Campbell Fire Department Trucks and Emergency Vehicles in accordance with all applicable criteria. Provide drive through circulation that minimizes the need for turning trucks around within the site boundary to the maximum extent possible.
- (b) Provide ladder vehicle access as a minimum to two sides of each facility and a minimum of three sides of all sleeping quarters to accommodate the Fire Department's trucks and emergency vehicles.
- (c) Design for the Fort Campbell Fire Department's heaviest vehicle, 84,000 lbs. The ladder truck turning radius is 46'-0". Fire lanes shall have a minimum 20'-0" clear width. Grass paver type products may be used for emergency vehicle access if soils engineering studies indicate ground can support such structures. Verify requirements with FTC Fire Department and ensure that the base is prepared to completely support the required loads.
- (d) Provide parking area at the Operation Storage Facility for organizational parking for 10 vehicles (assuming HMMWV 15'x7').

#### 6.4. SITE ENGINEERING

## 6.4.1. Existing Topographical Conditions

The Government has provided a three dimensional digital topographic and utility survey. Bring any discrepancies which are found in the Government furnished survey to the immediate attention of the Government for clarification. The survey provides control points based on state plane coordinates and identifies horizontal and vertical datums.

A topographic survey for this site has been prepared by the Government and included as a part of this contract in Appendix J. Additionally, CAD files containing topographic survey data will be provided upon request. The Government provided survey is provided for information only to be used in the development of the conceptual design in response to this solicitation. The Contractor is responsible for obtaining topographic survey data to support the design after award.

Site shall meet the requirements of ASHRAE 189.1.

6.4.2. Existing Geotechnical conditions: See Appendix A for a preliminary geotechnical report.

- 6.4.2.1. Geotechnical Engineer. A qualified independent testing agency shall observe and test subgrade suitability (by proof rolling operations), fill placement and compaction operations on a full time basis as directed by the Contractor's project Geotechnical Engineer.
- 6.4.3. Fire Flow Tests See Appendix D for historical fire flow test results. Use test results for proposal purposes and estimating the basis of design for fire flow and domestic water supply and for preparing the proposal cost estimate. After award, verify test results. Coordinate with Contracting Officer and CH2MHill to perform flow test on the water system at the anticipated points of connection in order to provide up- to -date flow information during the design phase. Point of contact for CH2M Hill is Chris Semler, (931) 431-2015. If test results indicates that the available flow or pressure has deteriorated from the data provided in Appendix D, bring this to the attention of the Government.
- 6.4.4. Pavement Engineering and Traffic Estimates:
- 6.4.4.1 Pavement Design. Minimum flexible pavement sections shall consist of 3.5 inches of asphalt (1.5 inches of surface course and 2 inches of base course) and 8 inches of aggregate subbase and/or base. Minimum rigid pavement section shall consist of 6 inches of concrete and 8 inches of aggregate subbase and/or base. The minimum subbase/base can be neglected if the subgrade has a CBR greater than 30.
- (a) Do not use Reclaimed Asphalt Pavement (RAP) in the asphalt surface wearing course.
- 6.4.5. Traffic Signage and Pavement Markings

Not Applicable.

- 6.4.6. Base Utility Information
- 6.4.6.1. Utilities
- (a) The Installation's DPW supervises infrastructure and utilities and in some cases they are owned and operated by private entities. Obtain and verify actual utility locations by calling Tennessee One-Call (1-800-351-1111) prior to start of any excavation work. General location of existing utility services such as potable water, sanitary sewer, electric, natural gas, and communications are located:

Refer to Appendix J for locations.

- (b) Install all utility lines underground. Avoid installing utility lines under pavement to the maximum extent possible. Utility lines that must cross under roadways shall be jack and bore or directional drill and sleeve including water, natural gas, electric, communications and cable TV lines.
- (c) Do not construct buildings over or within 10 feet of any new or existing utility lines, to include Water and Wastewater, Storm Sewer, Sanitary Sewerage, Gas, and COMM. Coordinate with respective provider to determine final routing of lines, and locations of connections points.
- 6.4.6.2. Water Distribution and Sanitary Sewerage System:
- (a) CH2M Hill is the owner and operator of the Fort Campbell water distribution sanitary sewerage system. Design and construct the new distribution system and new sewer lines, required building service and sewer lines, and any modifications to the existing distribution lines and main sewers in accordance with the latest edition of CH2M Hill's "Fort Campbell Water and Wastewater Design Guide and Construction Standards". Coordinate with CH2M Hill to determine the locations of connections to the existing water distribution system and final routing of the water distribution lines and service lines

including the locations of the distribution mains, and the locations of fire hydrants and post indicator valves. In addition coordinate the routing of the new or relocated main sanitary sewer lines, the routing and locations of the new building sewer lines, the locations of connection points to the main sewer system, the locations of existing sewer lines to be removed, the locations of new and existing manholes, the locations of lift stations and the location of force mains. Submit to CH2M Hill a completed "Application for Water and Wastewater Connection" form and the associated application fee. Include adequate time in the proposal for the design of the water system, the acquisition of State permits, and the construction of the water lines. Point of contact for CH2M Hill at Fort Campbell is Chris Semler, (931) 431-2015. Alternate contact for CH2M HILL is Robert Neath (314) 421-0313.

- (b) Contact CH2M HILL representative in a timely manner to coordinate water and sewer service to the facilities being constructed or renovated under this contract. No water and wastewater design or construction may begin without the execution of a permit issued by CH2M HILL. All new construction must satisfy the terms of the permitting process before water or wastewater services will be activated. Comply with all policies, procedures, standards, specifications and details required by CH2M HILL governing the design, construction and supply of water and sewer services required under this contract.
- (c) After award and during the design phase of the project, coordinate with CH2M Hill and submit preliminary drawings to CH2M Hill for review. The drawings shall show all new distribution lines, fire hydrants, new service lines, and any modifications to existing distribution system. In addition, show all new main and building sewer lines, manholes, pumping stations, force mains, and any modifications to existing sewer lines, tie-in points, and projected sewer flowrate from each building and at each manhole.
- (d) Base the design of the water distribution system on the static and residual water pressure conditions as shown in Paragraph 6.4.3 Fire Flow Tests.
- (e) Determine the following for each building in the project and provide this information to CH2M Hill:
- the required capacity of domestic water supply
- the domestic water service line size
- the required capacity of the fire water service line
- the fire water service line size and
- the location of the entrances to the building of the domestic water and fire water service lines.
- (f) Coordinate the sequence and timing of all water line tie-ins to existing water lines with CH2M Hill. No work associated with the water system shall begin until all required permits and approvals for the water system are obtained. Existing water service lines and mains serving buildings on the site which remain occupied during construction shall remain in service, uninterrupted, until those buildings are abandoned or until the new water distribution line has been accepted by the Government.
- (g) Coordinate the sequence and timing of all tie-ins to existing sewer lines with CH2M Hill. Do not begin construction of the sanitary sewer system until all required permits and approvals for the sanitary sewer system are obtained. Existing sanitary lines serving buildings on the site which remain occupied during construction shall remain in service, uninterrupted, until those buildings are abandoned.
- (h) Submit the final design drawings and specifications for review and comment. Include any changes as a result of the comments in the drawings and specifications prior to the start of construction.
- (i) Connect the water meter to the building Direct Digital Control in accordance with Paragraph 6.2.2.1.
- (j) CH2M Hill will inspect all construction of water distribution piping and sanitary sewer piping. Point of contact for CH2M HILL at Fort Campbell is Chris Semler, (931) 431-2015. Alternate contact for CH2M HILL is Robert Neath (314) 421-0313.
- (k) Field Quality Control for Sanitary Sewer Distribution System. The contracting officer and CH2M Hill will conduct field inspections and witness field tests specified. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing including means for water transport when water is needed. CH2M Hill will furnish water needed for field tests.
- 6.4.6.3. Gas Distribution System:

- Clarksville Gas and Water Department (CG&W) is the owner of the Fort Campbell gas distribution system. CG&W is responsible for the adequacy of design and construction of the required building service lines and modifications to any existing distribution lines. Coordinate with CG&W to determine the routing of any new or relocated gas distribution lines, the routing and locations of new and existing service lines, the locations of connection points to the main gas distribution system, the locations of existing gas distribution lines to be removed, and the locations of new valves. Coordinate directly with CG&W to obtain the cost of the design, permits, and construction of the required building service lines to the five foot line up to and including meters and regulators and any necessary modifications to the distribution lines. Include this cost in the appropriate line item in the CLIN schedule. CG&W may require the following information to determine the cost of the gas system changes: the capacity of gas required for each building; the low pressure gas service line size for the building; the location of the entrances to the buildings of the gas service lines, and locations of the gas regulators and meters. Include adequate time in the proposal for the design of the gas system and the acquisition of permits and approvals. Point of contact for CG&W at Fort Campbell is Randall Lewis, (931) 542-9600. Point of contact for CG&W pertaining to gas service line capacity, size, routing, and points of connection to the gas distribution system is Mike Young, (931) 645-7422.
- (b) After award, during the design phase of the project, provide information to CG&W about the expected building gas consumption and shall coordinate with CG&W to complete the gas distribution system design.
- (c) Design and installation of the gas distribution system must be in accordance with all policies, procedures, standards, specifications and details required by CG&W. Determine the following for each building in the project:
- the required capacity of gas service,
- the low pressure gas service line size, and
- the preferred location of the service entrance including the gas regulators and meters.
- (d) C&W will furnish and install meters and regulators on all buildings. The Contractor shall connect the meters to the building Direct Digital Control system in accordance with paragraph 6.2.2.1. The Contractor shall be responsible for all costs incurred for the gas system installation, including meters and regulators.
- (e) Do not abandon in place any gas lines.
- (f) Include the following in the design plans and specifications:
- the routing of gas distribution and gas service lines outside the buildings
- the location of gas meters and regulators
- existing gas distribution and service lines to be removed
- (g) Coordinate the sequence and timing of all gas line construction activities with CG&W. No work associated with the gas system shall begin until all required permits and approvals for the gas system are obtained. Include adequate time in the proposal for the design of the natural gas system and the acquisition of permits and approvals.
- (h) Submit the final design drawings and specifications for review and comment, and include any changes as a result of the comments in the drawings and specifications prior to the start of construction.

#### 6.4.6.4. Electrical:

(a) Furnish and install a meter on electric service to each building. Equip the electric meter with a pulse initiator. Connect the pulse initiator on the electric meter to the building Direct Digital Control system. Coordinate all new electrical work with Fort Campbell DPW. The points of contact are Mihir Chaudhuri at (270) 798-9725 or email <a href="mailto:mihir.chaudhuri@us.army.mil">mihir.chaudhuri@us.army.mil</a>, or Robert Galbraith at (270) 798-2232 or email robert.t.galbraith@us.army.mil.

#### 6.4.6.5. Telecommunications:

(a) Government Telephones and Data Connectivity. Furnish and construct all outside plant manholes, duct, conduit, and the required distribution cables, between underground terminal boxes and the building central communications closet for Government telephones and data connectivity. Install 3"x4" duct from the closet manhole to the facility telecommunications room. Install 4"x4" duct back along roadways were no duct exists. Toneable trace wire will be installed in at least one of the ducts in the ductbank. Install manholes at a maximum of every 500 feet of duct. Install 4-cell fiber mesh in the duct to accommodate fiber optic cable. Duct shall be concrete encased and protected in all areas, under road surfaces, and in storm drainage area that are subject to washout, in accordance with I3A. Install duct prior to road surfacing. Coordinate with Network Enterprise Center (NEC) during the design process. The Points of contact for NEC are Greg Lantz at (270) 798-6238 or email gregory.lantz@us.army.mil.

#### 6.4.6.6. Cable Television:

- (a) Provide cable television outlets in areas as required by I3A. Design, furnish, and install all conduit, wiring and outlet boxes within the facilities. Comcast will be responsible for all the interior jacks and faceplates. Coordinate with Comcast during the design process. The Point of contact for Comcast during design and construction is Bill Goodwin at (615) 244-7462 ext. 1115646 (office) or (615) 405-5589 (cell) or email <a href="mailto:billy\_goodwin@cable.comcast.com">billy\_goodwin@cable.comcast.com</a> Field verify the locations of the point of service (tie point) and facility demarcation point with Comcast prior to start of work.
- (b) Provide two inch conduit installed from telecommunication room to point of accessible connectivity at nearest pole with existing CATV.

#### 6.4.7. Cut and Fill

#### 6.4.7.1. Grading.

- (a) All Fort Campbell projects should generally maintain existing topography and slopes while recognizing standard minimum and maximum gradients. There should be a balance of the quantity of cut and fill which would create a smooth transition of graded areas into the existing natural terrain. The plan should reflect selective site clearing that preserves groups of trees. Grading should manage site runoff to maintain the rate and quantity of flow to pre-development levels, or reduce site runoff where possible. Apply the principles of positive drainage to control the conditions that remove rainfall away from facilities and functions. Lawn sheet flow shall not flow over sidewalks or paved areas. Do not drain new parking areas onto existing streets and do not drain existing streets into new parking areas. Site designs should seek to minimize the disturbance of land, utilize natural drainage paths where possible, and take into account future construction in the area. Site design should also minimize the impact of construction activities on drainage and prevent loss of soils by water and wind erosion. Designs that improve on existing water quality by incorporating sustainable design principles are encouraged, and consistent with budget constraints and activity requirements. Incorporate sustainable design principles to improve existing water quality.
- (b) The finished grades adjacent to the new building will be a minimum of 6 inch below finished floor except where grades are required on walk ways and entrances to buildings that are handicap accessible. Slope finish grades away from the building at 5% for the first 10 feet and then at a minim of 1% to existing or new storm drainage. Use a preferred minimum gradient or 1% in all parking areas. The maximum gradient used parallel from front to rear of a space shall be 5% and from side to side (width of the space) shall be 1-1/2%.
- 6.4.7.2. Historically, the potential for sinkholes does exist at Fort Campbell. The preliminary site characteristics for this particular site are located in Appendix A. Geotechnical Information.

#### 6.4.8. Borrow Material

(a) Use only the approved borrow pit. Provide a written list of all personnel and equipment that will be located at the site during borrow operations. Immediately report to the site operational authority any

evidence of unauthorized personnel or activities at the site, including unauthorized dumping of wastes, littering, and any other activities that present a potential risk to human health or the environment. Immediately report any problems with runoff and erosion controls. Maintain a daily haul record, including truck counts and estimated volume per truck load. Submit the haul record to the COR on a weekly basis.

## 6.4.9. Haul Routes and Staging Areas

(a) Use Gate 7 as the Haul Route to the construction work area. Refer to Appendix J, Borrow/Disposal Area Plan for Haul Route.

Refer to Appendix J for Haul Route.

6.4.10. Clearing and Grubbing:

### 6.4.11. Landscaping:

- (a) Provide landscaping in accordance with UFC 4-010-01 and the Standard Appendix I, Acceptable Plants List. Use the services of a qualified Landscape Architect, experienced in site planning and planting design. Provide a complete, integrated landscape-planting plan consisting of trees only for the overall project. The design shall reflect appropriate groupings and street tree plantings to define the open spaces. Choose tree materials on the basis of plant hardiness, climate, soil conditions, low maintenance, and quality. All selected tree and plant materials shall be easily maintained and tolerant of the specific site conditions. Incorporate sustainable design principles into the selection of plants. Plant only during periods when beneficial results can be obtained. Planting for site development within the 5-foot line shall consist of establishing groundcover (turf or other materials) consistent with adjacent landscaped areas. Additional landscaping such as ornamental planting at building entrances may be provided as a project betterment.
- (b) Passive Barriers may be installed as a landscape component and consist of any combination of berms, steep banks, ditches, fences, walls, bollards, trees, and other plant materials that is located between the vehicular circulation areas and the building(s). Trees may be used as long as the spacing between branch structures and size at the time of installation would prevent vehicle intrusion. Some species will require a double row with close proximity to achieve this functionality.
- (c) Maintenance during Planting Operation.

Maintain installed plants in a healthy growing condition. Begin maintenance operations immediately after each plant is installed and continue until the plant establishment period commences.

(d) Plant Establishment Period.

On completion of the last day of the planting operation, the plant establishment period for maintaining installed plants in a healthy growing condition shall commence and shall be in effect for the remaining contract time period not to exceed 12 months. When the planting operation extends over more than one season or there is a variance to the planting times, the plant establishment periods shall be established for the work completed.

(e) Maintenance during Establishment Period.

The maintenance of plants shall include straightening plants, tightening stakes and guying material, repairing tree wrap, protecting plant areas from erosion, maintaining erosion material, supplementing mulch, accomplishing wound dressing, removing dead or broken tip growth by pruning, maintaining edging of beds, checking for girdling of plants and maintaining plant labels, watering, weeding, removing

and replacing unhealthy plants. If used, irrigation systems shall be for plant establishment only. Remove at the end of this period. Ft Campbell will not furnish potable water for irrigation.

## (f) Unhealthy Tree.

Section: 01 10 00

A tree shall be considered unhealthy or dead when the main leader has died back, or 25 percent of the crown is dead. Determine the cause for an unhealthy plant. Unhealthy or dead plants shall be removed immediately and shall be replaced as soon as seasonal conditions permit in accordance with the following warranty paragraph.

## (g) Warranty.

Furnished plants shall be guaranteed for a period of 12 months beginning on the date of inspection by the Contracting Office to commence the plant establishment period, against defects including death and unsatisfactory growth, lack of adequate maintenance, neglect, or by weather conditions unusual for the warranty period.

### 6.4.12. Turf:

## (a) Seed.

State approved seed of the latest season's crop shall be provided in the original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with applicable State seed laws. Seed mixtures shall be proportioned by weight. Weed seed shall not exceed one percent by weight of the total mixture.

### (b) Sod.

State approved sod shall be provided as classified by applicable State laws. Each individual sod section shall be of a size to permit rolling and lifting without breaking. The sod shall be relatively free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than one (1) inches in any dimension, woody plant roots, and other material detrimental to a healthy stand of turf. Sod that has become dry, moldy, or yellow from heating, or has irregular shaped pieces of sod and torn or uneven ends shall be rejected. Sod shall be machine cut to a uniform thickness of 1-1/4 inches within a tolerance of 1/4 inch excluding top growth and thatch. The limitation of time between harvesting and placing sod shall be 36 hours.

#### (c) Sprig Quality.

The cultivar shall be provided as healthy living stems, stolons, or rhizomes with attached roots, including two (2) or three (3) nodes, and shall be from four (4) to (6) inches long, without adhering soil. Sprigs shall be provided which have been grown under climatic conditions similar to those in the locality of the project. Sprigs shall be obtained from heavy and dense sod, free from weeds or other material detrimental to a healthy stand of turf. Sprigs that have been exposed to heat or excessive drying shall be rejected. The time limitation between harvesting and placing sprigs shall be 24 hours.

### (d) Temporary Turf Cover.

When there are contract delays in the turfing operation or a quick cover is required to prevent erosion, the areas designated for turf shall be seeded with a temporary seed. When no other turfing materials have been applied, the quantity of one-half of the required soil amendments shall be applied and the area tilled.

### (e) Final Turf.

The turf shall be installed during appropriate planting times and conditions recommended by the trade for the type and variety of turf specified. The turf operations shall be performed only during periods when beneficial results can be obtained. Drainage patterns shall be maintained. The turf shall be installed by using the methods as recommended by the trade for the type and variety of turf specified. Immediately

after turfing, the area shall be protected against traffic or other use by erecting barricades and providing signage as required. The turf establishment period for establishing a healthy stand of turf shall begin on the first day of work under the turfing contract and shall end three (3) months after the last day of the turfing operation. An unsatisfactory stand of turf shall be repaired as soon as turfing conditions permit.

## 6.4.12.1. Satisfactory Stand of Turf:

(a) Seeded Lawn & Field Area.

A satisfactory stand of turf from the seeding operation is defined as a minimum of 150 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

(b) Sodded Area.

A satisfactory stand of turf from the sodding operation is defined as living sod uniform in color and texture. Bare spots shall be no larger than two (2) inches square. Sod shall be placed in all ditch flow lines and slopes, around each building, and a 10 foot strip adjacent to all structures such as curbs, sidewalks, roads, catch basins, etc.

(c) Sprigged Area.

A satisfactory stand of turf from the sprigging operation is defined as a minimum of 20 sprigs per square meter (2 sprigs per square foot). Bare spots shall be no larger than 9 inches square. The total bare spots shall not exceed two (2) percent of the total sprigged area.

- 6.4.12.2. Maintenance During Establishment Period:
- (a) The maintenance of the turfed areas shall include eradicating weeds, eradicating insects and diseases, protecting embankments and ditches from erosion, maintaining erosion control materials and mulch, protecting turf areas from traffic, mowing, watering, post-fertilization, and replacing unsatisfactory turf areas. If used, irrigation systems shall be for plant establishment only. Remove at the end of this period. Ft Campbell will not furnish potable water for irrigation.

### 6.5. ARCHITECTURE

6.5.1. General: To the maximum extent possible within the contract cost limitation, the buildings shall conform to the look and feel of the architectural style and shall use the same colors as adjacent facilities as expressed herein and shall conform with the Fort's Campbell Real Property Master Plan. The Government will evaluate the extent to which the proposal is compatible with the architectural theme expressed in the RFP during the contract or task order competition. The first priority in order of importance is that the design provides comparable building mass, size, height, and configuration compared to the architectural theme expressed herein. The second priority is that design is providing compatible exterior skin appearance based upon façade, architectural character (period or style), exterior detailing, matching nearby and installation material/color pallets, as described herein.

## 6.5.2. **Design**

- 6.5.2.1. Appendix F is provided "For Information Only", to establish the desired site and architectural themes for the area. Appendix F identifies the desired project look and feel based on **Fort Campbell's** Installation Architectural Theme from existing and proposed adjacent building forms; i.e. building exterior skin, roof lines, delineation of entrances, proportions of fenestration in relation to elevations, shade and shadow effects, materials, textures, exterior color schemes, and organizational layout.
- 6.5.2.2. The design should address Fort Campbell's identified preferences. Implement these preferences considering the following:
- (a) Achievable within the Construction Contract Cost Limitation (CCL)

- (b) Meets Milestones within Maximum Performance Duration.
- (c) Achieves Full Scope indentified in this Solicitation
- (d) Best Life-Cycle Cost Design
- (e) Meets the Specified Sustainable Design and LEED requirements.
- (f) Complies with Energy Conservation Requirements Specified in this RFP.
- 6.5.2.3. Priority #1. Visual Compatibility: Facility Massing (Size, Height, Spacing, Architectural Theme, etc.) Exterior Aesthetic Considerations: The buildings massing, exterior functional aesthetics, and character shall create a comprehensive and harmonious blend of design features that are sympathetic to the style and context of the Installation. The Installation's intent for this area is:

Site and Architectural conceptual drawings are shown in Appendix J.

- 6.5.2.4. Priority #2. Architectural Compatibility: Exterior Design Elements (Materials, Style, Construction Details, etc.) Roofs, Exterior Skin, and Windows & Door Fenestrations should promote a visually appealing compatibility with the desired character while not sacrificing the integrity and technical competency of building systems.
- 6.5.2.5. See Appendix F for exterior colors that apply to Architectural character at Fort Campbell. The manufacturers and materials referenced are intended to establish color only, and are not intended to limit manufacturers and material selections.
- 6.5.2.6. Additional architectural requirements:
- (a) Install fall protection anchor points on all roofs with a slope greater than 2:12
- (b) Exterior Skin. If the Offerors proposal consists of brick, split faced or scored CMU, which will be exposed to weathering, provide efflorescence testing and prevention measures. Schedule tests far enough in advance of starting masonry work to permit retesting. Apply water repellant primer and stain to all exterior architectural CMU walls after completion of exterior work and when the masonry is not subject to damage by construction activities.
- (c) Hardware. Provide a removable Small Format Interchangeable Core (SFIC) "I/C 7 pin Insta-Key" integrated master keying system for all doors. SFIC's shall be compatible with the existing "I/C 7 pin Insta-Key" system used at Fort Campbell. Combination locks used in secured areas shall be Mass Hamilton X09 type or LKM 7000 by Lockmasters Inc with an S&G 2740-100; Do not use the CDX-09. Electric locks shall be stand alone Best BASIS "G" system with encoders and Kiosk. Coordinate installation with the DPW Locksmith Shop. Point of contact is Bob Ayers, (270) 798-3581 (office).
- (d) Telecommunication Room and Electrical Room locks shall be *Insta-Key* cored and compatible with the Mortise lock Schlage Model CL5594-MGK-SFS-626-ATR or Cylindrical Lock Schlage Model CL5196-MGK-SFS-626-ELB-ATR.
- (e) Mechanical Rooms shall have an exterior building access only for maintenance personnel and accessible to maintenance vehicles. Provide a hasp and DPW approved padlock in addition to standard *Insta-Key* core.
- (f) Telecommunications Rooms shall have an interior access point unless otherwise specified or indicated. In the case of exterior access, install equipment cabinet(s) instead of racks in the Telecommunications Rooms. Cabinet(s) shall be dust rated with glass front door and accessible rear panel.
- (g) Not applicable
- 6.5.3. Programmable Electronic Key Card Access Systems:

Key card access is not applicable for this project.

## 6.5.4. INTERIOR DESIGN

6.5.4.1. Interior building signage requirements:

Provide a complete interior signage system. Signage shall include at a minimum room names and numbers.

- 6.5.4.2. Interior Design Considerations:
- (a) Interior Partitions and Walls.

The use of wall coverings that do not breathe such as vinyl wall coverings is not permitted on the interior face of exterior walls due to the tendency for mold to develop.

- (b) Interior Glass and Glazing: Coordinate the arrangement of fenestrations with the proposed furniture layout.
- 6.5.4.3. Furniture, Fixtures and Equipment Design Development:
- (a) During design development, coordinate the location of furniture so that it does not interfere with other building systems (i.e. electrical and communication outlets, thermostats, etc.).
- (b) Coordinate with USACE and DPW during design development. Point of contact for DPW, Master Plans is Sharon (Davis) Presley at (270) 956-2926 or email sharron.davis@us.army.mil.
- 6.6. STRUCTURAL DESIGN
- 6.6.1. Site Specific Loading Requirements
- 6.6.1.1 Structural Loading. Design building structures for the following types of minimum site specific loads per most recent versions of ASCE-7 and IBC.
- 6.6.1.1. Roof Live Load 20 psf
- 6.6.1.2. Snow Load 15 psf (pg, ground snow load)
- 6.6.1.3. Wind Load 90 mph, 3-second gust
- 6.6.1.4. Seismic Criteria As determined from a site specific geotechnical investigation, but not less than the following values:

Ss = 0.59gS1 = 0.19g

And not more than the following values:

Ss= 0.74g S1= 0.22g

- 6.6.2 The structural design shall meet all of the seismic requirements of the Applicable Codes and Standards including a continuous load path and interconnection, consideration of plan irregularities and effects due to inherent and accidental torsion, and consideration of building expansion joints. Seismic design also includes the bracing of various systems, piping, hangars, etc.
- 6.6.3. Note that areas of Fort Campbell contain Karst geology and are subject to potential sinkholes.
- 6.6.4. The structural system shall be compatible with building use. For example, do not locate columns in rooms requiring visibility or open space, such as entries, common areas, etc.
- 6.6.5. Extend bearing portions of substructure to levels below the frost line. Frost penetration is 22 inches below grade.
- 6.6.6. Treat subgrades under all facility foundations to resist subterranean and other wood destroying insects known to exist in the vicinity of the site. Treat in accordance with the environmental criteria referenced in this document.

- 6.6.7. Radon Mitigation: Ensure that the building prevents/mitigates the accumulation of radon gas. Fort Campbell requires the installation of radon mitigation features be included in all new construction as shown in the applicable Appendix of this document. The design and construction of foundation walls, slabs, and crawl spaces shall include provisions for the reduction of radon entry and facilitate its removal. Radon exhaust vents shall extend through the roof. Test exhaust vents prior to occupany. If radon is realized in amounts past the acceptable levels, exhaust fans will be required. An equitable adjustment (credit or increase, as appropriate) will be provided pursuant the contract Changes clause. For additional information, contact the TSCA Program Manager of the Fort Campbell Environmental Division at (270) 798-9604.
- 6.6.8. Water Barrier: A capillary water barrier is required under all interior slabs-on-grade. The capillary water barrier shall, as a minimum, prevent the mitigation of termites, radon, and moisture.
  6.6.9. Equipment Pads: Elevate interior floor or slab-on-grade mounted equipment on minimum 4 inch thick concrete pads to prevent accumulation of water and metal corrosion. Elevate exterior on-grade mounted equipment on minimum 6 inch thick concrete pads. Turn down perimeter of exterior pads to a level below the frost line.

#### 6.7. THERMAL PERFORMANCE

There are no additional requirements other than those previously stated/referenced.

#### 6.8. PLUMBING

There are no additional requirements other than those previously stated/referenced.

- 6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS
- 6.9.1. Primary Electrical Distribution.

The point of connection for the primary feed to the site shall be

extended from existing facilities for the existing shoothouse and adjacent UAC. Data distribution shall be to the AAR Building.

## 6.9.1.1 Construction Compliance Inspection (CCI)

The government will perform a Construction Compliance Inspection (CCI) to assess construction progress and to identify problem areas with target interface items early to avoid costly and extensive corrective actions and project delays at the target Interface Inspection (TII). Target Interface items include all portions of construction that physically connect to the target equipment or provide for the protection of the equipment. The US Army TRADOC Program Integration Office (TPIO-Live) will schedule the CCI in conjunction with the RTLP MCX (HNC), the applicable Corps of Engineers District, PEO-STRICOM, TACOM-RI, the installation, and the Major Command (MACOM) when construction has reached a point that the following items can be checked (usually about midpoint of construction). At a minimum: Data Enclosure is mounted in Shoothouse electrical room, the lighting contactor and panelboard mounted in Shoothouse electrical room, power and data outlets (UTO) to one target location mounted in Shoothouse area, provisions should be shown in the Shoothouse for routing of the power and data cables to the UTO locations from the electrical room data enclosure, provisions should be shown in AAR for routing data cables from the data termination rack throughout the AAR, wireway (conduit) routed for fiber cable from underground into the data enclosure at the Shoothouse and data termination rack in AAR, provide samples of SC type connector, fiber optic cable, and cat6 cable and the AAR should have the data termination rack on-site and the location identified within the AAR. A CCI Checklist has been developed

to conduct this inspection. Any "required" items noted during the CCI shall be corrected prior to continuing to the next phase. All other items shall be corrected in a timely manner.

## 6.9.1.2 Target Interface Inspection (TII)

Section: 01 10 00

The Government will perform a Target Interface Inspection (TII) when all target equipment interface points are completed and ready for inspection (usually around 90 – 95 percent construction completion or about 30 days prior to the end of construction). The US Army TRADOC Program Integration Office (TPIO-Live) will schedule the TII in conjunction with the RTLP MCX (HNC), the applicable Corps of Engineers District, the installation, the MACOM, PEO-STRICOM, and the target installation contractor. At a minimum: power is turned on to the AAR and Shoothouse site, all items such as the data enclosure, lighting contactor, UTO (power and data), fiber cabling, data cabling, power cabling, wireways(conduits), lightning protection, and grounding for the Shoothouse are complete. All items such as the data termination rack, wireways(cable trays/conduits), power to the DTR, lightning protection, and grounding for the AAR are complete. HVAC in AAR is located and on-site or installed to determine size. A TII Checklist has been developed to conduct this inspection. Any items noted during the TII shall be corrected prior to closeout of the construction contract.

#### 6.9.1.3 Telecommunication Service:

Contractor shall furnish, install and terminate fiber cables from the point of connections to the new telecommunications backboard in the After Action Review Building and operation Storage Building. Coordinate pairs or strands to be used with the U.S. Army Signal Network Enterprise Center (NEC) representative. the contractor shall provide service entrance termination hardware and any cabling elements required within the facility. The contractor shall test the cables "end to end".

## (a) Voice:

Point of connection is the fiber backbone at the entrance to Range 44 (Intersection of Angels Road and Killebrew Road). Provide direct burial fiber from this point of connection to the After Action Review Building. Once inside the range Operations Control Area (ROCA), cabling shall be installed in a conduit system. Provide 6 pair of voice grade copper cabling from the telecommunications cabinet in the After action review Bldg to the Operations Storage bldg. Provide and install fiber-to-copper and copper-to-fiber conversion equipment and associated components. Verify with NEC that the applicable conversion equipment is used when converting from fiber to copper.

## 6.9.1.4 Shoothouse Receptacles:

The Shoothouse standard design will install 4 double target outlets and 14 single target outlets. A single UTO (Universal target Outlet) is defined as a NEMA L14-20R and one NEMA 4X female RJ-45 outlet with screw on dust cover for data. A double UTO is defined as two NEMA L14-20R and two RJ-45 outlets for data. The Nema L14-20R outlet shall be provided in a single gang weatherproof enclosure with a weatherproof while in use outlet cover. The NEMA 4X, RJ-45 data outlet shall be a female 1/4 turn bayonet style outlet in a weatherproof enclosure with a connector cap. Installed RJ-45 data outlets shall be compatible with Amphenol RJ Field Series male cord end providedwith target system. the target and data outlets shall be located around the shoothouse catwalk per the revised SHH-E-1 plan. Maintenance receptacles shall be mounted on the catwalk fram 450mm (18") above the catwalk and spaced no more than 25 feet apart. these maintenance receptacles shall be 120V, 20A, GFCI, duplex receptacle shall be installed in the electrical room for maintenance purposes.

- (a) Provide primary ductbank with one spare conduit. Ductbank shall be concrete encased.
- (b) Primary conductors shall be copper. Aluminum is not permitted.
- (c) Provide load-break cutouts and arrestors at point of connections for underground primary services. For overhead distribution tap lines, provide load break cutouts.
- (d) Coordinate connections with Fort Campbell DPW, Electrical Utility Section.
- 6.9.2. Underground Secondary Distribution System.

The system shall consist of direct buried conduit and copper conductors.

## 6.9.3. Transformers.

Transformers shall be pad-mounted type, 12.47 kV delta primary and secondary voltage as appropriate for load(s) to be served. Service transformers, for all 15kV and below, 3-phase underground fed installations, shall be of the pad-mounted type. Transfomers shall contain FR3 dielectic fluid. The high-voltage compartment shall be dead-front construction. Primary switching and protective devices shall include loadbreak switching, fuse protection, medium-voltage separable load-break connectors, universal bushing wells and inserts or integral one piece bushings and surge arresters. The nameplate rating for the transformer shall not be less than 110 percent of the KVA demand load calculated for the transformer. Provide copper windings, not aluminum. The enclosure shall include a hasp and pad lock.

### 6.9.4. Street and Area Lighting.

- 6.9.4.1 Provide lighting for the project site, at existing and new roadway intersections, and at intervals not exceeding 60.9 m (200 ft) between intersections. Provide area lighting at intervals not exceeding 60.9 m (200 ft) along area walkways not otherwise illuminated; and at all steps. Exterior lighting (parking lot, street, building, etc) shall be LED, Induction, LEP (Light Emitting Plasma), or energy saving technology. "Dark Sky" Lighting is a mandatory requirement for the numerous flight paths over the installation to insure the safety of the flight crews and equipment. Parking lot and security lighting will be provided at a maintained level of 0.5 to 1.0 footcandles and shall have a uniformity ratio, maximum to minimum, of 20:1 or less. All building entrances will be illuminated to 10 footcandles. Parking lot and walkway lighting shall be individually fused and mounted on aluminum poles. Install fuses for the pole-mounted fixtures in the pole base. Control shall be by photocell. This control shall be by means of one photocell per pole. Install a programmable timer with manual switch override in the Mechanical Room.
- (a) Coordinate lighting control requirements for all exterior lighting systems with the Customer, subject to the Contracting Officer's approval, to include the sequencing of the programmable timer.
- (b) Light poles installed in the parking lot shall be installed on raised concrete foundations for protection from vehicles. Light poles provided along the roadways shall be breakaway. The pole locations shall be in accordance with the Applicable Criteria.

- (c) Direct burial conduit is required for street light and area light circuits. All exterior lighting (parking lot, street, building, etc.) shall be either 120, 208, or 277 Volt. 480-Volt lighting is not permitted.
- 6.9.4.2 Select and locate lighting fixtures to maintain the minimum foot-candle requirements for safety and security purposes. Beyond that, aesthetic considerations should take precedence. Light poles should be consistent and provide uniformity throughout the installation. Determine the pole height by their intended function. Size light fixtures proportionally to the intended pole height. Coordinate final fixture selection with the Contracting Officer for approval.
- 6.9.5. Telecommunications:
- 6.9.5.1. General. All communications equipment, materials, and work shall be in accordance with I3A requirements and are subject to approval by the NEC office and the Contracting Officer.
- 6.9.5.2. The NEC will remark cables upon justifiable request by the Contractor. Contractor is not responsible to maintain locates, except to use reasonable care. For NEC contact information, refer to paragraph 6.4.6.5.
- 6.9.5.3. Entrance conduits in all buildings shall be a minimum of three-way, 4 inch ducts.
- 6.9.5.4. Do not implement Free Space Optic (FSO) systems unless approved by the NEC Plans and Architecture Branch..
- 6.9.5.5. Coordinate with the NEC for a list of areas where 48" of cover is required above the top of the duct. Duct bank encasements shall be in accordance with I3A requirements.
- 6.9.5.6. Rotary trenchers or plowing are not allowed during trenching or excavation, except in undeveloped range and training areas. NEC prefers the method of open trenching, using bucket type equipment, i.e., backhoe and track hoe. The maximum width of the trench is in accordance with the type of equipment used to dig.
- 6.9.5.7. Splice cable either in manholes or pedestals. Do not make buried splices or use quasite boxes unless NEC approves in writing.
- 6.9.5.8. Do not use aerial cable.
- 6.9.5.9. Provide stainless steel splice cases for all copper cable splices, or an equivalent which shall be approved by the lead planner or the Service Management Division Chief. NEC requires submittals for splice cases and splice modules prior to work beginning. Specify splice cases for the particular environment in which they shall be placed and size to accommodate the cable count spliced. Design end plates for the number and size of the cables served by the splice and design to seal around each cable individually. All splice cases shall be re-enterable and shall contain all necessary equipment to be installed properly, adhering to all appropriate electrical codes.
- 6.9.5.10. Install warning signs in accordance with the following:
- Sign mounted to steel PSP stake; orange in color
- 4' below ground in concrete; rising 5' above ground
- No closer than 2 feet from the center of the ditch
- If there is a change in direction, position a sign immediately at the turn showing the line
- Although I3A states every 250' for those areas that end up being less than 250' provide sign(s) accordingly, even if an additional sign is necessary.
- 6.9.5.11. Provide a minimum copper cable size 25 pair.
- 6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

Coordinate with Fort Campbell NEC during the design process. Submit all requested deviations from the mandatory design criteria in writing for approval at the discretion of the Government.

- 6.10.1. Provide dual jacks in lieu of single jacks. Dual jacks shall be two CAT 6 RJ45 type with green inserts.
- 6.10.2. Provide Copper Voice and Data jacks in new facilities or in facilities with no existing building cabling system in accordance with the I3A Criteria Section 2.4.1.1 (TIA/EIA T568A configuration). If the existing building cabling is of type TIA/EIA T568B, then install TIA/EIA T568B.
- 6.10.3. Voice and Data drops shall conform to the following wire color scheme:
- Green Voice and NIPRnet data
- Red SIPRnet (Secret) data
- Orange JWICS (Top Secret) data
- All faceplates shall be neutral in color. Inserts shall be the same color as the wiring used for that particular jack.
- 6.10.4. Install Fiber Optic patch panels in cabinets or racks that house the LAN equipment. Do not install fiber optic patch panels on backboards.
- 6.10.5. Terminate copper distribution on 110 type rack mounted patch panels only. Do not install 110 type patch panels on backboards.
- 6.10.6. Make all new fiber optic terminations using LC connectors. Terminate any connectors already in place in renovated buildings or additional fiber connections in existing buildings with the identical type of existing fiber optic connectors.
- 6.10.7 Key telecommunication Room doors separate from other locks in the building IAW DPW standards. Provide two copies of the key to the NEC Logisitics Branch. Reference section 6.5.2.6, (b) for additional lock requirements.
- 6.10.8 Provide lightning protection, based on NFPA 780 (2004) Annex L Lightning Risk Assessment of the facility. Provide grounding, bonding, shielding for all facilities. Provide grounding straps and connect to the building grounding system. Provide grounding points in vehicle and equipment parking areas on 20 foot centers (maximum) and coordinated with the power and data board units. Provide ground strap on walls, and two (2) grounding points on each functional bay floor. Provide a bonding grounding in oil storage room. If lightning protection is required, install with mechanical fasteners on standing seam metal roofs.
- 6.11. HEATING, VENTILATING, AND AIR CONDITIONING
- 6.11.1 Integrate the control system to the installation's existing UMCS. The existing UMCS is FMCS at Fort Campbell, and shall be as described in Paragraph 6.2.1. Coordinate with Installation Energy Manager during the design process. Point of contact for Fort Campbell FMCS's is John Register at (270)-484-2741 or email John.W.Register@us.army.mil .
- 6.11.1. Outdoor design conditions include the following.

Winter Dry-Bulb: Design Dry Bulb Day,14°F (99%)

Summer Dry-Bulb: Design Dry Bulb Day, 92°F (1%) Design Wet Bulb Day, 88°F

(MCDB)

Summer Wet-Buld: Design Dry Bulb Day, 76°F (MCWB) Design Wet Bulb Day, 78°F

(1%)

## 6.12. ENERGY CONSERVATION

6.12.1. Inclusion of Renewable Energy Features. The following renewable energy features have been determined lifecycle cost effective, are included in the project budget and shall be provided:

Not Applicable.

## 6.13. FIRE PROTECTION

- 6.13.1. The Fire Alarm Control Panel shall be fully compatible with the existing King-Fisher Industrial Radio Alarm Control System (IRACS) presently in use at Fort Campbell. The fire alarm AM transmitter shall be Government furnished, contractor installed. Mass Notification: The required mass notification system shall be in a separate cabinet from the fire alarm system.
- 6.13.1.1. The fire alarm system shall be an open protocol type in that it is designed and installed such that the Government or its agents are able to perform: repair, replacement, upgrades, and expansions of the system without further dependence on the original contractor or system manufacturer.
- 6.13.1.2. Fire Lite, Notifier, Mirtone, and EST are approved Fire Alarm and Mass Notification systems authorized for installation in Fort Campbell facilities based on demonstrated ability to meet UFC 4-021-01 and Fort Campbell criteria and in order to reduce training, maintenance, and reserve parts cost. The proposed fire alarm system particular model must meet all requirements as stated above.
- 6.13.1.3. There shall be no requirement for software locks, special tools and any other proprietary equipment to maintain, add devices to or delete devices from the system, or test the Fire Alarm system. Fire detection and alarm systems shall be able to be programmed from the control panel and the Government's laptop. Provide any software, cables / interface devices required to manipulate the system, coordinated with Government personnel and jointly installed on the DPW laptop computer without any licensing agreements, signed documents or any requirements upon the Government to rely on any contractor or manufacturer for maintenance or manipulation of the system.
- 6.13.1.4. Provide space within exterior mechanical and within electrical rooms to accommodate the fire alarm and mass notification panels as well as the Government supplied Contractor installed Kingfisher transmitter. Provide exterior access to the Mechanical Room and where possible to the Electrical Room to allow Fire Dept access. Install remote fire alarm annunciators only when required.
- 6.13.1.5. Fire alarm system shall be addressable type, Class A, looped.
- 6.13.1.6. Install a weather proof exterior fire alarm strobe on the outside of the building on the street side to signal responding Fire Dept.
- 6.13.1.7. Provide a bronze, Series 3200 Knox-Box located within 10 feet of front entrance to the building at a mounting height of five feet.
- 6.13.2. Mass Notification/PA System:
- 6.13.2.1. The Mass Notification System shall be capable of connecting to a future facility wide system using dry contacts and 600 Ohm audio inputs
- 6.13.2.2. Provide LOC (local operating console) without locking door next to staff duty or receptionist station (where applicable to the facility type). Provide additional LOC's as required by applicable criteria.

- 6.13.2.3. The Mass Notification system shall be pre-programmed MNS (male voice). Audible announcement messages shall be as follows: and include the NFPA 72 (2010) Para 24.4.2.17 "this is a test" requirement:
- (a) WEATHER (100 KHZ Steady tone, 5 Seconds); THE NATIONAL WEATHER SERVICE HAS ISSUED A SEVERE WEATHER ALERT FOR THIS AREA. TUNE TO LOCAL RADIO AND TELEVISION STATIONS FOR FURTHER GUIDANCE.
- (b) SUSPICIOUS ACTIVITY (Fast whoop, 5 Seconds); MAY I HAVE YOUR ATTENTION PLEASE! A POSSIBLE BREACH IN SECURITY HAS BEEN REPORTED. PLEASE REMAIN CALM. YOU ARE INSTRUCTED TO TAKE APPROPRIATE SECURITY MEASURES AND REPORT SUSPICIOUS PERSONNEL, VEHICLES, PACKAGES OR ACTIVITIES TO SECURITY PERSONNEL.
- (c) FIRE (horn sound, 5 seconds) ATTENTION, ATTENTION. A FIRE EMERGENCY HAS BEEN REPORTED. PLEASE LEAVE THE BUILDING USING THE NEAREST EXIT.
- (d) TORNADO WARNING (horn sound, 5 seconds) ATTENTION, ATTENTION. A TORNADO WARNING HAS BEEN ISSUED FOR THIS AREA. A TORNADO WARNING HAS BEEN ISSUED FOR THIS AREA.
- (e) CHEMICAL RELEASE WARNING (horn sound, 5 seconds) ATTENTION, ATTENTION. A CHEMICAL RELEASE HAS BEEN ISSUED. STAY INSIDE BUILDINGS AND CLOSE WINDOWS AND DOORS UNLESS ADVISED BY AUTHORITIES TO EVACUATE AREA. CHEMICAL RELEASE. STAY INSIDE BUILDINGS AND CLOSE WINDOWS AND DOORS UNLESS ADVISED BY AUTHORITIES TO EVACUATE AREA.
- (f) ALL CLEAR (horn sound, 5 seconds) ATTENTION, ATTENTION. THE EMERGENCY IS OVER. I REPEAT THE EMERGENCY IS OVER. RESUME YOUR NORMAL DUTIES.
- (g) EVACUATION WARNING (horn sound, 5 seconds) ATTENTION, ATTENTION. THIS IS AN EMERGENCY EVACUATION ORDER. REMAIN CALM, FOLLOW THE INSTRUCTIONS OF THE EMERGENCY OFFICALS. THIS IS AN EMERGENCY EVACUATION ORDER. OBAY THE EMERGENCY OFFICALS. REMAIN CALM.
- (h) BOMB THREAT WARNING (horn sound, 5 seconds) ATTENTION, ATTENTION, A BOMB THREAT ALERT HAS BEEN ISSUED FOR THIS BUILDING. ALL PERSONNEL ARE TO EVACUATE IMMEDIATELY USING THE NEAREST EXIT. FURTHER INSTRUCTIONS WILL BE ISSUED OUTSIDE THE BUILDING BY EMERGENCY RESPONSE TEAMS.
- (i) TERRORIST THREAT WARNING. (horn sound, 5 seconds) MAY I HAVE YOUR ATTENTION, PLEASE. A TERRORIST THREAT HAS BEEN RECEIVED. EFFECTIVE IMMEDIATELY, WE ARE OPERATING "SECURE AND LOCKDOWN PROCEDURES." ALL PERSONNEL SHOULD REMAIN CALM AND STAY WHERE YOU ARE. PLEASE AWAIT FURTHER INSTRUCTIONS."
- (j) FPCON C (wail, 5 seconds) ATTENTION, ATTENTION. FORT CAMPBELL IS IN FORCE PROTECTION CONDITION CHARLIE. ALL PERSONNEL IMMEDIATELY IMPLEMENT FPCON CHARLIE ACTIONS.
- (k) FPCON D (Wail, 5 seconds) ATTENTION, ATTENTION. FORT CAMPBELL IS IN FORCE PROTECTION CONDITION DELTA. ALL PERSONNEL IMMEDIATELY IMPLEMENT FPCON DELTA ACTIONS.
- 6.13.3. Portable Fire Extinguishers.
- 6.13.3.1. Provide and install flush or semi-mounted Fire Extinguisher Cabinets and Brackets in accordance with UFC 3-600-01 and NFPA 101 to accommodate Government Furnished/Government Installed Fire Extinguishers. Do not use glass or lockable doors in fire extinguisher cabinets.
- 6.13.3.2. Government will provide ten-pound portable dry chemical (Class ABC) Fire Extinguishers manufactured by Amerex.

- 6.14. SUSTAINABLE DESIGN
- 6.14.1. LEED Rating Tool Version. This project shall be executed using LEED-NC Version 3.
- 6.14.2. LEED Minimum Rating. This project includes no facilities that are required to achieve a specific LEED achievement level. Project shall achieve and document all points required by other portions of the RFP and all points that are feasible, but there is no minimum required LEED achievement level.
- 6.14.3. Credit Validation: LEED registration, compiling of documentation at LEED OnLine and use of the LEED Letter Templates is not required. Contractor has the option to register the project, compiling of documentation at LEED OnLine and use the LEED Letter Templates. In this case, payment of registration fees and administration/team management of the online project will be by the Contractor.
- 6.14.4. Commissioning: See Appendix M for Owner's Project Requirements document(s).
- 6.14.5. LEED Credits Coordination. The following information is provided relative to Sustainable Sites and other credits.

## MR Credit 2 Construction Waste Management.

The Installation does not have an on-post recycling facility available for Contractor's use.

## Regional Priority Credits (Version 3 only)

The project zip code is 42223.

See LEED Multiple Contractor Responsibilities Table(s) for additional information.

- 6.14.6. LEED Credit Preferences, Guidance and Resources. See Appendix L LEED Project Credit Guidance for supplemental information relating to individual credits.
- 6.14.7. Multiple Contractor Combined Project. When site work and building(s) are accomplished by separate contractors, it is a Multiple Contractor Combined Project for purposes of LEED scoring and documentation. This project is part of a Multiple Contractor Combined Project that includes site work and building(s) accomplished by separate contractors. See Appendix LEED Requirements for Multiple Contractor Combined Projects and Appendix LEED Multiple Contractor Responsibilities Table(s) for special requirements for this project.
- 6.14.8. Additional Information

Not used.

- 6.15. ENVIRONMENTAL
- 6.15.1. Solid Waste Disposal/Diversion Practices:
- 6.15.1.1. Solid Waste Disposal/Diversion Practices shall be in accordance with Appendix E, Environmental information. All construction activities at Fort Campbell shall require at least a 50% diversion of construction materials such as excess lumber, roofing, drywall, carpet, piping, cardboard, etc to be diverted from the landfill. Reference Appendix J, for Borrow/Disposal Area Plan.
- 6.15.1.2. Government policy shall apply to sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy, the Contractor shall: (1) Practice efficient waste management when sizing, cutting, and installing products and materials, (2) use all reasonable means to divert construction, and demolition waste from landfills and incinerators and to

facilitate their recycling or reuse. Recycling Construction and Demolition Debris guidance and documentation requirements can be found on the Fort Campbell Environmental Web Site: (http://www.campbell.army.mil/campbell/directorates/DPW/envdiv/Pages/RecyclingConstructionDemo.asp

- 6.15.1.3. Submit a Waste Management Plan (WMP) within 15 days after Notice to Proceed (NTP) and prior to initiating any site preparation work. Include the following:
- (a) Name of individuals on the Contractor's staff responsible for waste prevention and management.
- (b) Actions that will be taken to reduce solid waste generation.
- (c) Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas and equipment to be used for processing, sorting, and temporary storage of wastes.
- (d) Characterization, including estimated types and quantities, of the waste to be generated.
- (e) Name of landfill and/or incinerator to be used and the estimated costs for use, assuming that there would be no salvage or recycling on the project.
- (f) Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations and accept used materials such as materials exchange networks and Habitat for Humanity.
- (g) List of specific waste materials that will be salvaged for resale, salvaged and reused, or recycled. Recycling facilities that will be used shall be identified.
- (h) Identification of materials that cannot be recycled / reused with an explanation or justification.
- (i) Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the materials and the incineration and/or landfill cost avoidance.

## 6.15.2. Sediment and Erosion Control:

Section: 01 10 00

**x**).

Design and construct the project in accordance with the Fort Campbell Policy for Stormwater Erosion and Sediment Control at Construction Sites. This policy can be found on the Fort Campbell Environmental Web Site: (http://www.campbell.army.mil/envdiv/en1.htm)

- 6.15.3. Ban on use of asbestos containing materials, lead based paint and PCB's.
- 6.15.3.1 Do not use asbestos containing materials (ACMs), lead based paint (LBP), or PCBs.
- 6.15.3.2 Provide the required No Asbestos Containing Material (ACM) Certification in accordance with the following.
- (a) Design Phase. Before final payment of the project design fee, the designer of record (DOR) shall submit to the government, on their firm's letterhead, a signed, stamped and dated copy of the following statement:
- "I hereby certify that no asbestos-containing material (ACM) was specified as a building material in any construction document for this project. Furthermore, I certify that no product containing mineral fibers was specified as a building material in any construction document for this project unless I either
- -'Have on file and have submitted to the Government, the manufacturer's certification that the material does not contain asbestos,' or
- 'Have supplied to the Government documentation to show that the material has been microscopically examined by an AIHA- or NVLAP-certified laboratory and the lab has determine that it does not contain asbestos.' "

- (b) Construction Phase. Before final payment to the Contractor, the Contractor's project engineer/manager will sign and submit to the Government, on the Contractor's letterhead, a dated copy of the following statement:
- "I hereby certify that to the best of my knowledge no asbestos-containing material (ACM) was used as a building material during this project. I understand that the building Owner presumes that all materials marked 'May contain mineral fibers' are asbestos unless I either:
- 'Have on file and have submitted to the Government the manufacturer's certification that the material does not contain asbestos,' or
- 'Have supplied to the Government documentation to show that the material has been microscopically examined by an AIHA- or NVLAP-certified laboratory and the lab has determine that it that it does not contain asbestos.'
- 6.15.4. Air pollution restrictions applicable to this project do not allow materials to be burned on Government premises.
- 6.15.5. The Installation Forrester must complete a survey before any trees with diameters greater than 6 inches are removed. This is in addition to Section 3.1 Land Resources under Section 01 57 20.00 10.
- 6.15.6. Maintain all excavations, stockpiles, access roads, waste areas, and all other work ares free from excess dust to such a reasonable degree as to avoid causing hazard or nuisance.
- 6.15.7. Underground Storage Tanks (USTs):

Do not install UST's without approval from the DPW Environmental Dvision. If permitted, USTs shall be double walled steel fiberglass coated with interstial monitoring and automatic tank gauging. The monitoring system shall be compatible with the systems already in use and capable of being remotely monitored by the Environmental Division. Do not install used oil USTs.

- 6.15.8. Aboveground Fuel Storage Tanks (ASTs).
- 6.15.8.1. ASTs shall conform to all Federal, State, Local regulations and guidelines and these design requirements.
- 6.15.8.2. ASTs shall be double-walled type tanks. Provide means to establish the integrity of the secondary containment.
- 6.15.8.3. ASTs shall rest on foundations, made of concrete, masonry, piling, or steel. Design tank foundations to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.
- 6.15.8.4. The Directorate of Public Works , Environmental Division, Petroleum Storage Tank Manager is the Installation Local Authority Having Jurisdiction (AHJ) who must approve any design proposal and construction before any installation of an AST.
- 6.15.8.5. Location of Aboveground Fuel Storage Tanks (ASTs). The local AHJ must approve all proposed installations sites of ASTsin writing prior to installation.
- (a) No AST shall be installed closer than 5-feet from any type of an electrical disconnect device.
- (b) Locate ASTs between the size of 60 U.S. gallons and 2,000 U.S. gallons no closer than 10-feet from any building, lean-to, or property line.

(c) ASTs shall have at the minimum of 5 ft of unobstructed clearance on all sides to facilitate refueling, maintenance and serviceability.

- (d) No AST shall be installed without having at least a 15-foot aerial clearance from overhead or underground electrical lines, which includes but limited to weather heads, transformers, and fuses.
- (e) The minimum distance between any two ASTs shall be 3-feet.
- (f) The minimum distance between an AST with Gasoline or Diesel fuel and a LP tank shall be 20-feet.
- (g) Locate Used Oil tanks close to the source of generation, i.e., just outside the building.
- 6.15.9. Aboveground Fuel Lines.
- 6.15.9.1. Below ground fuel lines are not permitted for use with an AST.
- 6.15.9.2. Aboveground supply and return lines. Suspend fuel lines a minimum of 6 inches off the ground and support every 3-feet with some type of approved support. Protect fuel lines against corrosion with protective features that prohibit any collision from motor vehicles. All fuel lines shall be of black carbon-type steel. All AST supply fuel lines shall be ½-inch inside diameter and all return fuel lines shall be ¾-inch inside diameter, unless otherwise directed by Local Authority having Jurisdiction. All supply fuel lines shall have a shut off valve located as close as possible to the AST. There shall be no traps of check valves in the return fuel line to the AST. All pipe joints shall be of the threaded type, no welding of pipes or of the joints shall be permitted. Joints shall be made liquid tight and shall be threaded, except that listed flexible connectors are permitted where installed with prior written approval of the Local AHJ. All threaded joints shall be made up tight with a suitable thread sealant or lubricant. Joints in piping systems handling Class I liquids shall be welded when located in concealed spaces within buildings.
- 6.15.10. Normal Venting for Aboveground Tanks.
- 6.15.10.1. Venting requirements shall be in accordance with current Unified Facilities Guide Specifications, Section 13202, Fuel Storage Systems requirements. Stage I vapor recovery is the process of recovering vapors when a storage tank is filled. Stage I vapor recovery is mandatory on all Army Facilities.
- 6.15.10.2. Prevent the development of vacuum or pressure sufficient to exceed the design pressure due to filling or emptying and the atmospheric temperature changes.
- 6.15.10.3. If any tank has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, base the vent size on the maximum anticipated simultaneous flow.
- 6.15.10.4. Arrange the outlet of all vents and vent drains on tanks equipped with venting to permit pressures exceeding 2.5 psig to discharge in such a way as to prevent localized overheating of, or flame impingement on, and part of the tank, in the event vapors from such vents are ignited.
- 6.15.10.5. Where vent pipe outlets for tanks storing Class I liquids are adjacent to building or public ways, locate them so that the vapors are released at a safe pint outside of buildings and not less than 12 ft. above the adjacent ground level. In order to aid their dispersion vapors shall be discharged upward or horizontally away from closely adjacent walls. Locate vent outlets so eaves will not trap the flammable vapors or other obstructions and at least 5 ft from building openings.
- 6.15.10.6. Emergency Venting for Fire Exposure for Aboveground Tanks.

- (a) Every aboveground tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure fires. This requirement shall also apply to each compartment of a compartmented tank, the interstitial space of a secondary containment type tank, and the enclosed space of tanks of closed top dike construction.
- (b) Arrange the outlet of all vents and vent drains on tanks, equipped with emergency venting to permit pressures exceeding 2.5 psig to discharge in such a way as to prevent localized overheating of or flame impingement on any part of the tank, in the event vapors from such vents are ignited.
- 6.15.11. Miscellaneous AST Requirements.
- 6.15.11.1. All ASTs permanently installed shall have a device(s) for fuel leak detection, fuel level, and all other monitoring requirements.x
- 6.15.11.2. Mark ASTs in accordance with NFPA, 704.
- 6.15.11.3. Mark ASTs in accordance with NFPA. 704.
- 6.15.11.4. All ASTs shall have some type of spill containment that will hold 110% of the AST capacity.
- 6.15.11.5. All ASTs that have filling and emptying connections for any Class I or Class II, flammable liquids shall be closed and liquid tight when not in use and shall be properly identified.
- 6.15.11.6. All ASTs fill caps shall have an AHJ approved means of locking when not being refueled.
- 6.15.11.7. All ASTs shall have some device of fire-fighting equipment in the immediate area. (Contact Fort Campbell Fire Prevention Section for further details).
- 6.15.11.8. Provide means for determining the level of liquid in the tank. This means shall be accessible to the delivery operator
- 6.15.11.9. Take precautions to prevent the ignition of flammable vapors. Sources of ignition include, but are not limited to:

- OpenFlames - Spontaneous ignition

- Lightning - Frictional heat or sparks

- Hot surfaces - Static electricity

- Radiant heat - Electrical sparks-

- Smoking -Stray currents-

- Cutting and welding -Ovens, furnaces, and heating equipment

- 6.15.11.10. Install bollards around all ASTs to prevent vehicular collision with the tank.
- 6.15.11.11. Construction of secondary containment structures for mobile fuel tankers or storage tanks shall be concrete construction and have sufficient capacity to hold 110% of the largest tank / mobile fuel tanker that it will hold. The secondary containment stormwater discharge valve or valves must be capable of completely draining a containment in 2 hours or less. Four-inch values are recommended. Locate the outlet drain(s) valves and piping at the lowest evevation of the containment. The bottom of the outlet drain pipe shall be flush with bottom of the containment. Berm control expansion/contraction joints shall be filled with a fuel-resistant sealant. If the concrete berm is placed upon existing concrete, then seal the joint between the new and old concrete with a fuel-resistant sealant. Seal storm water drain

Section: 01 10 00 W912QR-23413770 CERTIFIED FINAL-003 Page 114 of 947

piping with fuel resistant sealant. Provide an adequate amount of reinforced concrete above and below the drain pipe(s) to prevent crack formation in the concrete at this location.

Contractor Site Specific Spill Plan (CSSSP). Prepare and submit CSSSP through the 6.15.12. COR to Fort Campbell Environmental Division. Develop the CSSSP as outlined in the Fort Campbell Environmental Handbook. A link to the fill-in-the-blank version of the CSSSP is located on the Fort Campbell Web site at:

(http://www.campbell.army.mil/campbell/directorates/DPW/envdiv/Pages/Spills/aspx).

- Green Procurement. Purchase, supply, and use environmentally referable products and services to the maximum extent practicable. Consider Green products as the "first choice" for procurement. Additional information can be obtained in the applicable Appendix.
- Sustainable Installation Management System (SIMS). Fort Campbell has implemented an environmental management system entitled SIMS to proactively deal with the environmental impacts of its processes, activities, and services. Fort Campbell's approved Significant Environmental Aspects are located on the DPW Environmental Division web page (http://www.campbell.army.mil/campbell/directorates/DPW/envdiv/Pages/default.aspx) under "Sustainable Installation Management System (SIMS/EMS)" on the left menu.
- Fort Campbell uses the ISO 14001:2004 as the standard for its SIMS. All personnel performing work for or on behalf of Fort Campbell should be aware of and understand Fort Campbell Environmental Policy. Fort Campbell offers SIMS General Awareness Training in the form of an 8 minute video. This video can be found on the Fort Campbell Environmental web site (http://www.campbell.army.mil/campbell/directorates/DPW/envdiv/Pages/default.aspx) under "Sustainable Installation Management System (SIMS/EMS)" on the left menu. Ensure that all subcontractors receive SIMS General Awareness Training.
- 6.15.14.2. Ensure that all goods and services used by the contractor or any of its subcontractors do not deviate from the installation Environmental Policy, objectives and targets of the EMS. Perform work in a manner that conforms to all appropriate Environmental Management Programs and Operational Controls identified by Installation's SIMS, including pollution prevention, waste reduction, energy use, and natural resource protection. Provide monitoring and measurement information as necessary for the organization to address environmental performance relative to the environmental and energy management goals. In the event of non-compliance with Fort Campbell's legal or other requirements or non-conformance with the installation SIMS, take immediate corrective action, perform a root-cause analysis of the non-compliance/non-conformance and develop preventive action to keep the noncompliance/non-conformance from recurring. In the event of any noncompliance with any federal, state, or local environmental law, regulation or requirement, immediately respond by taking all appropriate corrective action and notify the Contracting Officer's Representative (COR) and the DPW Environmental Division. Ensure that employees and subcontract employees are aware of their roles and responsibilities with regard to the SIMS and how these requirements affect the work performed under this contract. Additionally, when ordering supplies for use on Installation, all contractor personnel must favor energyefficient, recycled or reclaimed material whenever practicable.
- 6.15.14.3. The responsibility of all contractor personnel include, but are not limited to:
- Recycling all eligible material, including glass, paper (including magazines), plastic, aluminum, and cardboard to the maximum extent practicable;
- Reducing the amount of hazardous material and/or solvent used by purchasing fewer hazardous materials and by increasing the use of products with recycled content;
- Reducing the amount of solid waste from construction and demolition debris, and scrap metal sent to municipal and rubble landfills by reducing, reusing, and recycling; and

Section: 01 10 00 Page 115 of 947

Conserving energy and water usage by turning off lights and equipment when not in use and using only the necessary amount of water needed to complete the required tasks. Continuous conservation of our natural resources is a must.

- Direct any questions regarding SIMS to the Installation SIMS Action Officer (Karen Kopp-Voshel, phone 270-798-9597, e-mail karen.kopp@us.army.mil) or Contracting Officer's Representative. For more information regarding environmental compliance requirements contact DPW-Environmental at (270) 798-9645.
- 6.15.16. Inadvertent Disturbance and Discovery of Cultural Resources. If a previously unidentified historic property or archaeological site is disturbed or if any archaeological remains, including human skeletons, are discovered during construction, immediately halt all activity within in a one hundred (100) foot radius of the disturbance and/or discovery, notify the Fort Campbell Cultural Resources Program 270-412-8174, and implement interim measures to protect the site and/or discovery from looting and vandalism.
- 6.15.16.1. The Fort Campbell Cultural Resources Program will evaluate the disturbance and/or discovery and provide interim recommendations to the contractor within two working days of notification if the contractor can proceed with the planned activities. In accordance with the current Programmatic Agreement of Operations the Cultural Resources Program will then consult with the appropriate Tribal Nations and State offices to meet the Installation's legal obligations.
- 6.16. PERMITS
- 6.16.1. Permits.

Obtain all permits (local, state and federal) required for design and construction of all site features and utilities. Provide information, as described below, to obtain all necessary permits.

6.16.2. Air Permits.

Provide air permit information to Fort Campbell Environmental Division. Two types of permits are required: (1) A construction permit; and (2) An operating permit. Obtain a construction permit based on the design prior to construction. Obtain an operating permit when the equipment is installed. Provide information for both types of permits to Fort Campbell using the Checklist for Non-Process Source and the Vent Stack Checklist. Each checklist is available from the Fort Campbell Environmental Division and shall be completed for each piece of fuel-burning equipment. The lead time for these permits is approximately 30 days, thus submit all information as soon as possible. Point of contact for these items is Patty Lockard, Fort Campbell Environmental Division, and (270) 798-9603.

- Fort Campbell (Christian (KY) and Montgomery (TN) Counties) was designated an ozone "maintenance" area in 2005. The installations maintenance plan requirements are designed to maintain the average ozone concentration levels at or below the maximum allowed to sustain compliance with the National Ambient Air Quality Standards. The redesignation as an "attainment maintenance area" will be in effect for 12 years. Section 176(c)(1) of the Clean Air Act (CAA) mandates the General Conformity Rule (GCR) analysis be completed by Fort Campbell to establish that any construction activity will not impede the continuation of the attainment status and ensure the action does not impede Kentucky or Tennessee air pollution control efforts in ozone "attainment maintenance areas". The rule requires that an analysis and other procedures (if required as a result of the analysis) be completed prior to the commencement of any of the project activities.
- Review is required for all proposed construction activity which will result in the emission 6.16.2.2. of surface ozone precursors (volatile organic compounds and nitrogen oxides) to ensure the action does

not impede Tennessee air pollution control efforts to gain attainment of the NAAQS for ozone. Non attainment designations for particulate matter (PM) are based on 3-year averages of either each years' annual average concentration (annual average) or on a 24 hour average basis (rolling 24 hour avg.).

- (a) PM2.5. Exceedance of either standard can result in an area being classified as non-attainment for PM2.5. If that should occur, PM2.5 will be considered and added to the GCR process as stated above.
- 6.16.2.3. Data is required to enable the Air Quality Program of the Fort Campbell Environmental Division to calculate the estimated emissions of ozone precursors resulting from construction equipment (mobile and stationary) burning fossil fuels and other Contractor vehicles (Contractor or private owned) operated on Fort Campbell as a result of the construction contract. To obtain this data representatives of the Fort Campbell Air Quality Program will need to contact either a Contractor representative and/or the Resident Office project manager, as designated by the Fort Campbell Resident Office. See 6.16.2.6 for examples of construction equipment and activities, which need to be identified as to their usage.
- 6.16.2.4. The primary source of the ozone precursors at Fort Campbell during construction activities is the burning of fossil fuels by mobile non-road construction equipment and other vehicles, including privately owned vehicles operated by construction Contractor personnel and Government supervising personnel (this applies only to that portion of usage directly applicable to the construction activity, which includes the commute to the construction site). In addition, stationary and/or portable units such as fossil fuel fired boilers, space heaters, and electric generators must be considered. Additional sources of concern that may be part of major construction activities include, but are not limited to, coating operations (spray booths), solvent cleaning operations, volatile organic fluids (fuels, etc.) dispensing and storage operations, and site remediation activities.
- 6.16.2.5. In addition to the data concerning ozone precursor emissions during the construction phase, data are also required to estimate what the emissions will be after the completion of the construction project. This includes evaluations to determine emission increases of ozone precursors resulting from any new permanent stationary sources; any potential increase in vehicle miles traveled by fossil fueled tactical, other federal Government owned, and private owned vehicles; and any increase in demands on current utility services (boiler plants, water plants, etc.). This data will be compiled from review of construction plans, drawings, and by interviews of points of contact other than the Contractor or the Fort Campbell Resident Office.
- (a) Fuel Burning Equipment (Natural Gas and/or Fuel Oil): For boilers > 10 MBTU or for any boiler that uses fuel oil, contact the Air Quality Program with specifications for boilers. For hot water heaters > 120 gallons, contact the Air Quality Program with specifications for hot water heaters. The Air Quality Program will submit the Boiler NESHAP Notification to EPA.
- (b) Concrete/ Asphalt: Describe whether operations of concrete batch plant/asphalt plant (including any use of a pug mill) will be on or off post. If on post, provide capacity and other design data to determine if air permits would be required and to determine other CAA related compliance issues. Approximately 120 day lead time to obtain state operating permit.
- (c) Debris Burning: Air pollution restrictions applicable to this project do not allow materials to be burned on the Government premises.
- (d) Debris Disposal: If construction debris is to be sent to a grinder for recycling, describe if the grinding equipment will be on or off post and if on-post, providegrinder capacity (tons/hour) and design in order to determine if air permitting and other CAA related compliance issues apply. Approximately 120 day lead time to obtain state operating permit.
- (e) Dust: Maintain all excavations, stockpiles, access roads, waste areas, and all other work areas free from excess dust to such a reasonable degree as to avoid causing a hazard or nuisance.

- (f) Ozone Depleting Chemicals: Refrigerants shall have an ozone depleting potential (ODP) of 0.05 or less.
- (g) Construction Equipment Listing. The list is not purported to be a complete list. It is based on some of the operations conducted during past major construction activities at Fort Campbell.
- Bulldozers
- Graders
- Excavators
- Backhoes
- Dump Trucks
- Fuel/Service Trucks
- Tractors
- Pug Mills (on site Fort Campbell)
- Concrete Batch Plant fossil fuel usage (on site Fort Campbell)
- Scrapers
- Ready-Mix Trucks
- Screed, Concrete, (if fossil fuel powered)
- Portable paint sprayers and any associated fossil fuel powered air compressors

- Fossil fuel fired powered air compressors used for activities other than powering paint applicators
- Fossil fuel powered electric generators,
- Lay Down Machines used in paving activities
- Rollers
- Compactors
- Water Trucks
- Pavement Stripping Machines
- Traffic road striping (vehicle and product applied)
- Loaders
- Compactors
- Curb and Gutter Pavers

6.16.2.6. The analysis must be completed prior to commencement of any of the construction project activities.

## 6.16.3. Water Permits.

Any change to the water distribution system requires an Approval from the State Government. The Contractor and the utility owner, CH2MHill, shall have shared responsibility in the coordination of the application for permit for work involving the water distribution system. Provide information as necessary during the design of the project to CH2M Hill for preparation of the permit application. Point of Contact for CH2M Hill at Fort Campbell is Chris Semler, (931) 431-2015. Alternate contact for CH2M HILL is Robert Neath (314) 421-0313.

## 6.16.4. Sanitary Sewer Permits.

Any change to the sanitary sewer system requires State approval. The Contractor and the utility owner, CH2MHill, shall have shared responsibility in the coordination of the application for permit for work involving the sanitary sewer system. Provide information as necessary during the design of the project to CH2M Hill for preparation of the permit application. Point of Contact for CH2M Hill at Fort Campbell is Chris Semler, (931) 431-2015. Alternate contact for CH2M HILL is Robert Neath (314) 421-0313.

## 6.16.5. Erosion and Sediment Control Permits.

Coordinate with the Fort Campbell Environmental Division to obtain the latest guidance on the Erosion and Sediment Control Permits. The point of contact is Mr. Dan Etson at phone number (270) 798-9784. No ground disturbing activities shall be made without first securing coverage under Fort Campbell's National Pollution Discharge Elimination System (NPDES) Permit and secondly ensuring all storm water controls are in place. DPW-Environmental maintains a blanket storm water discharge coverage under the

applicable state permit for all projects constructed during a calendar year. DPW- Environmental will issue the permit in each state to the Contractor once the Storm Water Manager has reviewed and approved all required environmental submittals. Submit all required submittal documents thirty (30) days prior to start of the project.

6.16.6. Fort Campbell Permits.

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit from the Fort Campbell Electrical Inspector in accordance with CAM Regulation 420-4 (Quality Assurance "Electrical" Inspection Standards). An Electrical Contractor Registration Form shall be completed. This form will be attached to the back of the copy of the CAM Regulation. The Contractor's license shall be validated against the Fort Campbell Review Board list of State Electrical Licenses valid on Fort Campbell KY before a permit can be obtained. Copies of CAM Regulation 420-4 and permits shall be obtained at DPW, Utilities Maintenance Building 868, Bastogne & 16th Street, Fort Campbell, Kentucky.

#### 6.17. DEMOLITION

All Deconstruction work shall be coordinated with Fort Campbell DPW prior to commencement of construction activities.

The existing Shoothouse Facility Deconstruction includes the following:

Existing Shoothouse (Range 44A)

Existing K-Span Structure (Bldg R044E)

Note: All sand and dirt from the deconstruction of the existing Shoothouse will be placed on the berm. Also the steel will be placed in a location (to be determined later) to be hauled off.

6.18. ADDITIONAL FACILITIES

Not Applicable.

End of Section 01 10 00.FINAL

# SECTION 01 32 01.00 10 PROJECT SCHEDULE

1.0	GENERAL
1.1.	REFERENCES
1.2.	QUALIFICATION
2.0	PRODUCTS (NOT APPLICABLE)
3.0	EXECUTION
3.1.	GENERAL REQUIREMENTS
3.2.	BASIS FOR PAYMENT AND COST LOADING
3.3.	PROJECT SCHEDULE DETAILED REQUIREMENTS
3.4.	PROJECT SCHEDULE SUBMISSIONS
3.5.	SUBMISSION REQUIREMENTS
3.6.	PERIODIC SCHEDULE UPDATE MEETINGS
3.7.	REQUESTS FOR TIME EXTENSIONS
3.8.	DIRECTED CHANGES
3.9.	WEEKLY PROGRESS MEETINGS
3.10.	OWNERSHIP OF FLOAT

3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

## 1.0 GENERAL

### 1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE) ER 1-1-11 (1995) Progress, Schedules, and Network Analysis Systems

ECB 2005-10 (2005) Scheduling Requirements for Testing of Mechanical Systems in Construction

(Both are available through the Publications page of the US Army Corps of Engineers TECHINFO Website at http://www.hnd.usace.army.mil/techinfo/. See link for Engineer Regulation ER 1-1-11).

## 1.2. QUALIFICATIONS

Designate an authorized representative who shall be responsible for the preparation of the schedule and all required updating (statusing) and preparation of reports. The authorized representative shall be experienced in electronic scheduling (has developed, created, and maintained) at least 2 projects similar in nature to this project and shall be experienced in the use of the scheduling software that meets the requirements of this specification.

#### 1.3. SUBMITTALS

Government approval is required for submittals with a "G" designation. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

## SD-01 Preconstruction Submittals

Project Schedule and required updates thereto: G

## 2.0 PRODUCTS (Not Applicable)

#### 3.0 EXECUTION

#### 3.1. GENERAL REQUIREMENTS

- 3.1.1. Submit a project schedule pursuant to Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS and as specified herein for approval, showing the sequence in which the Contractor proposes to perform the work and dates on which the Contractor contemplates starting and completing all schedule activities. The scheduling of the entire project, including the design and construction sequences is required. Contractor management personnel shall actively participate in its development. Designers, subcontractors and suppliers working on the project shall also contribute in developing an accurate project schedule. The schedule must be a forward planning as well as a project monitoring tool.
- 3.1.2. Approved Project Schedule. The approved project schedule shall be used to measure the progress of the work and to aid in evaluating requests for excusable time extensions. The schedule shall be cost loaded and activity coded as specified herein. The schedule will provide the basis for all progress payments. If the Contractor fails to submit any schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule
- 3.1.3. Schedule Status Report. Status the schedule on at least a monthly basis, as specified herein. If in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress including those that may be required by the

Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained. See paragraph 3.7.4.

3.1.4. Default Terms. Failure of the Contractor to comply with the requirements of the Contracting Officer shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

#### 3.2. BASIS FOR PAYMENT AND COST LOADING.

The schedule shall be the basis for determining contract earnings during each update period and therefore the amount of each progress payment. Lack of an approved schedule update or qualified scheduling personnel will result in an inability of the Contracting Officer to evaluate contract earned value for the purposes of payment. Failure of the Contractor to provide all information, as specified herein will result in the disapproval of the preliminary, initial and subsequent schedule updates. In the event schedule revisions are directed by the Contracting Officer and those revisions have not been included in subsequent revisions or updates, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until such revisions to the project schedule have been made. Activity cost loading shall be reasonable as determined by the Contracting Officer. The aggregate value of all activities coded to a contract CLIN as specified herein shall equal the value of the CLIN on the Schedule.

## 3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

The computer software system utilized to produce and update the project schedule shall be capable of meeting all requirements of this specification. Failure of the Contractor to meet the requirements of this specification will result in the disapproval of the schedule.

#### 3.3.1. Use of the Critical Path Method

Use the Critical Path Method (CPM) of network calculation to generate the project schedule. Prepare the project schedule using the Precedence Diagram Method (PDM).

## 3.3.2. Level of Detail Required

Develop the project schedule to an appropriate level of detail. Failure to develop the project schedule to an appropriate level of detail, as determined by the Contracting Officer, will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

## 3.3.2.1. Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities shall have Original Durations (OD) greater than 20 work days or 30 calendar days. Procurement activities are defined herein.

## 3.3.2.2. Design and Permit Activities

Include design and permit activities, including necessary conferences and follow-up actions and design package submission activities. Include the design schedule in the project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period.

Page 122 of 947

Section: 01 32 01.00 10

This shall be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item.

#### 3.3.2.3. Procurement Activities

Include activities associated with the submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days. A typical procurement sequence includes the string of activities: submit, approve/review, procure, fabricate, and deliver.

## 3.3.2.4. Mandatory Tasks

Include and properly schedule the following tasks (See also the Sample Preliminary Submittal Register Input Form):

- (a) Submission, review and acceptance of design packages, including BIM
- (b) Submission of mechanical/electrical/information systems layout drawings
- (c) Submission and approval of O & M manuals
- (d) Submission and approval of as-built drawings
- (e) Submission and approval of 1354 data and installed equipment lists
- (f) Submission and approval of testing and air balance (TAB)
- (g) Submission of TAB specialist design review report
- (h) Submission and approval of fire protection specialist
- (i) Submission and approval of testing and balancing of HVAC plus commissioning plans and data. Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements as well as ECB 2005-10
- (j) Air and water balancing
- (k) HVAC commissioning
- (I) Controls testing plan submission
- (m) Controls testing
- (n) Performance Verification testing
- (o) Other systems testing, if required
- (p) Contractor's pre-final inspection
- (q) Correction of punch list from Contractor's pre-final inspection
- (r) Government's pre-final inspection
- (s) Correction of punch list from Government's pre-final inspection
- (t) Final Inspection
- 3.3.2.5. Government Activities. Show Government and other agency activities that could impact progress. These activities include but are not limited to: approvals, design reviews, review conferences, release for construction of design package(s), environmental permit approvals by State regulators, inspections, utility tie-ins, Government Furnished Property/Equipment (GFP) and phasing requirements, if any.
- 3.3.2.6. Activity Responsibility Coding (RESP)

Assign Responsibility Code for all activities to the Prime Contractor, Subcontractor or Government agency responsible for performing the activity. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Equipment (GFE) and authorization to proceed with phasing requirements. Code all activities not coded with a Government Responsibility Code to the Prime Contractor or Subcontractor responsible to perform the work. Activities shall not have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE). Unacceptable code values are abbreviations of the names of subcontractors.

## 3.3.2.7. Activity Work Area Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities shall not have more than one Work Area Code. Not all activities are required to be Work Area coded. A lack of Work Area coding will indicate the activity is not resource or space constrained.

## 3.3.2.8. Contract Changes/Requests for Equitable Adjustment (REA) Coding (MODF)

Assign Activity code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer, with a Contract Changes/REA Code. Key all Code values to the Government's modification numbering system. Any activity or sequence of activities added to the schedule as a result of alleged constructive changes made by the Government may be added to a copy of the current schedule, subject to the approval of the Contracting Officer. Assign Activity codes for these activities with a Contract Changes/REA Code. Key the code values to the Contractor's numbering system. Approval to add these activities does not necessarily mean the Government accepts responsibility and therefore liability for such activities and any associated impacts to the schedule, but rather the Government recognizes such activities are appropriately added to the schedule for the purposes of maintaining a realistic and meaningful schedule. Such activities shall not be Responsibility Coded to the Government unless approved. An activity shall not have more than one Contract Changes/REA Code

## 3.3.2.9. Contract Line Item (CLIN) Coding (BIDI)

Code all activities to the CLIN on the Contract Line Item Schedule to which the activity belongs. An activity shall not contain more than one CLIN Item Code. CLIN Item code all activities, even when an activity is not cost loaded.

## 3.3.2.10. Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities, based upon the phase of work in which the activity occurs. Code activities to either a Design Phase or a Construction Phase. Code fast track design and construction phases proposed by the Contractor to allow filtering and organizing the schedule by fast track design and construction packages. If the contract specifies construction phasing with separately defined performance periods, identify a Construction Phase Code to allow filtering and organizing the schedule accordingly. Each activity shall have only one Phase of Work code.

## 3.3.2.11. Category of Work Coding (CATW)

Assign Category of Work code to all Activities based upon the category of work which the activity belongs. Category of Work Code must include, but is not limited to: Design, Design Submittal, design reviews, review conferences, Construction Submittal, Approvals (if any), Acceptance, Procurement,

Fabrication, Delivery, Weather Sensitive Installation, Non-Weather Sensitive Installation, Start Up, Test, and Turnover. Assign a Category of Work code to each activity. Each activity shall have only one Category of Work Code.

## 3.3.2.12. Definable Features of Work Coding (FOW1, FOW2, FOW3)

Assign a Definable Feature of Work Code to appropriate activities based on the definable feature of work to which the activity belongs. Definable Feature of Work is defined in Specification Section 01 45 04.00 10, Contractor Quality Control. An activity shall not have more than one Definable Feature of Work Code. Not all activities are required to be Definable Feature of Work Coded.

## 3.3.3. Scheduled Project Completion and Activity Calendars

The schedule interval shall extend from NTP date to the required contract completion date. The contract completion activity (End Project) shall finish based on the required contract duration, as adjusted for any approved contract time extensions. The first scheduled work period shall be the day after NTP is acknowledged by the Contractor. Schedule activities on a calendar to which the activity logically belongs. Activities may be assigned to a 7 day calendar when the contract assigns calendar day durations for the activity such as a Government Acceptance activity. If the Contractor intends to perform physical work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and holidays. Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive. Original durations must account for anticipated normal adverse weather. The Government will interpret all work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform work during those periods.

## 3.3.3.1. Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. Include as the first activity in the project schedule an activity called "Start Project" or "NTP". The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, with a zero day duration.

## 3.3.3.2. Schedule Constraints and Open Ended Logic

Constrain completion of the last activity in the schedule by the contract completion date. Schedule calculations shall result in negative float when the calculated early finish date of the last activity is later than the contract completion date. Include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the contract completion date for the project, and with a zero day duration or by using the "project must finish by" date in the scheduling software. The schedule shall have no constrained dates other than those specified in the contract. The use of artificial float constraints such as "zero fee float" or "zero total float" are typically prohibited. There shall only be 2 open ended activities: Start Project (or NTP) with no predecessor logic and End Project with no successor logic.

## 3.3.3. Early Project Completion

In the event the Preliminary or Initial project schedule calculates an early completion date of the last activity prior to the contract completion date, the Contractor shall identify those activities that it intends to accelerate and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. The last activity shall have a late finish constraint equal to the contract completion date and the schedule will calculate positive float. The Government will not approve an early completion schedule with zero float on the longest path. The Government is under no obligation to accelerate activities for which it is responsible to support a proposed early contract completion.

## 3.3.4. Interim Completion Dates

Constrain contractually specified interim completion dates to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date.

#### 3.3.4.1. Start Phase

Include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

## 3.3.4.2. End Phase

Include as the last activity for a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the specified completion date for that phase and a zero day duration.

## 3.3.4.3. Phase "X" Hammock

Include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" hammock activity shall be logically tied to the earliest and latest activities in the phase.

## 3.3.5. Default Progress Data Disallowed

Do not automatically update Actual Start and Finish dates with default mechanisms that may be included in the scheduling software. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the AS and AF dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's updated schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Disable program features which calculate one of these parameters from the other.

## 3.3.6. Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule..

## 3.3.7. Negative Lags and Start to Finish Relationships

Lag durations contained in the project schedule shall not have a negative value. Do not use Start to Finish relationships (SF).

## 3.3.8. Calculation Mode

Schedule calculations shall retain the logic between predecessors and successors even when the successor activity starts and the predecessor activity has not finished. Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") will not be allowed.

#### 3.3.9. Milestones

Include milestone activities for each significant project event including but not limited to: milestone activities for each fast track design package released for construction; design complete; foundation/substructure construction complete; superstructure construction complete; building dry-in or enclosure complete to allow the initiation of finish activities; permanent power complete; and building systems commissioning complete.

#### 3.3.10. Use of Primavera "P6"

If P6 is being used, the following settings are mandatory in the Preliminary Project Schedule, Initial Project Schedule and all schedule submissions to the Government:

- 3.3.10.1. Activity Codes shall be Project Level not Global or EPS level.
- 3.3.10.2. Calendars shall be Project Level not Global or Resource level.
- 3.3.10.3. Set Activity Duration Types to "Fixed Duration & Units".
- 3.3.10.4. Set Percent Complete Types to "Physical".
- 3.3.10.5. Use Default Time Period Admin Preferences "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Set Calendar Work Hours/Day to 8.0 Hour days. This is not to mandate the Contractor's work week. Alternate workweeks may be set up in "Calendar Settings".
- 3.3.10.6. Set Schedule Option for defining Critical Activities "Longest Path".
- 3.3.10.7. Set Schedule Option for defining progressed activities "Retained Logic".
- 3.3.10.8. Set up Cost loading a single lump sum Resource. The Price/Unit shall be \$1/hr, Default Units/Time shall be "8h/d", and select settings "Auto Compute Actuals" and "Calculate costs from units".
- 3.3.10.9. Activity ID's shall not exceed 10 characters.
- 3.3.10.10. Activity Names shall have the most defining and detailed description within the first 30 characters.

## 3.4. PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data CD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

## 3.4.1. Preliminary Project Schedule Submission

Submit the Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days for approval within 15 calendar days after the NTP is acknowledged. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Government acceptance of the

associated design package(s) and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (FOW1, FOW2, FOW3)

## 3.4.2. Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after NTP. The schedule shall demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. The Initial Schedule shall be at a reasonable level of detail as determined by the Contracting Officer. Include detailed design and permitting activities, including but not limited to identification of individual design packages, design submission, reviews and conferences; permit submissions and any required Government actions; and long lead procurement activities required prior to design completion. The Initial Project Schedule shall include the entire construction sequence and all fast track construction activities, with as much detail as is known at the time but, as a minimum, shall include all construction start and completion milestone activities, and detailed construction activities through the dry-in milestone, including all activity coding and cost loading. Include the remaining construction, including cost loading, but it may be scheduled summary in nature. As the design proceeds and design packages are developed, fully detail the remaining construction activities concurrent with the monthly schedule updating process. Constrain construction activities by Government acceptance of associated designs. When the design is complete, incorporate into the then approved schedule update all remaining detailed construction activities that are planned to occur after the dry-in milestone.

## 3.4.3. Design Package Schedule Submission:

With each design package submitted to the Government, submit a frag-net schedule extracted from the then current Preliminary, Initial or Updated schedule which covers the activities associated with that Design Package including construction, procurement and permitting activities.

## 3.4.4. Periodic Schedule Updates

Based on the result of the meeting specified in PERIODIC SCHEDULE UPDATE MEETINGS, submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made. Update the schedule to include detailed lower WBS activities procurement and construction activities as the design progresses, but not later than the submission of the final, un-reviewed design submission for each separate design package. The Contracting Officer may require submission of detailed schedule activities for any distinct construction that is started prior to submission of a final design submission, if such activity is authorized.

## 3.4.5. Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used. A template SDEF compatible schedule backup file (sdef.prx) is available on the QCS website: <a href="http://rms.usace.army.mil">http://rms.usace.army.mil</a>.

The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per Day
2	RESP	4	Responsible Party (e.g. GC, subcontractor, USACE)

Section:	01	32 (	)1	.00	) 1	0

3	AREA	4	Area of Work
4	MODF	6	Modification or REA number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of Work
7	CATW	1	Category of Work
8	FOW1	10	Feature of Work (used up to 10 characters in length)
9	FOW2	10	Feature of Work (used up to 20 characters in length)
10	FOW3	10	Feature of Work (used up to 30 characters in length)

#### 3.5. SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

#### 3.5.1. Data CD's

Provide two sets of data CD's containing the project schedule in the backup format. Each CD shall also contain all previous update backup files. File medium shall be CD. Label each CD, indicating the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and file names. Each schedule shall have a unique file name as determined by the Contractor.

## 3.5.2. Narrative Report

Provide a Narrative Report with the Preliminary, Initial, and each Periodic Update of the project schedule, as the basis of the progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical paths where the total float is less than or equal to 20 work days, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to communicate to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through its analysis. Identify and explain why any activities that, based their calculated late dates, should have either started or finished during the update period but did not.

## 3.5.3. Approved Changes Verification

Include only those project schedule changes in the schedule submission that have been previously approved by the Contracting Officer. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

## 3.5.4. Schedule Reports

The format, filtering, organizing and sorting for each schedule report shall be as directed by the Contracting Officer. Typically reports shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. The following lists typical reports that will be requested. One or all of these reports may be requested for each schedule submission.

## 3.5.4.1. Activity Report

A list of all activities sorted according to activity number.

#### 3.5.4.2. Logic Report

A list of detailed predecessor and successor activities for every activity in ascending order sorted by activity number.

## 3.5.4.3. Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

## 3.5.4.4. Earnings Report by CLIN

A compilation of the Contractor's Total Earnings on the project from the NTP to the data date. This report shall reflect the earnings of specific activities based on the agreements made in the schedule update meeting defined herein. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining progress payments. Group activities by CLIN Item number and sort by activity number. This report shall: sum all activities coded to a particular CLIN and provide a CLIN Item percent earned value; and complete and sum CLIN items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

## 3.5.5. Network Diagram

The network diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

## 3.5.5.1. Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

## 3.5.5.2. Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

## 3.5.5.3. Critical Path

Clearly show the critical path.

#### 3.5.5.4. Banding

Organize activities as directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

#### 3.5.5.5. S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

## 3.6. PERIODIC SCHEDULE UPDATE MEETINGS

Conduct periodic schedule update meetings for the purposes of reviewing the Contractor's proposed out of sequence corrections, determining causes for delay, correcting logic, maintaining schedule accuracy and determining earned value. Meetings shall occur at least monthly within five days of the proposed schedule data date and after the Contractor has updated the schedule with Government concurrence respecting actual start dates, actual finish dates, remaining durations and percent complete for each activity it intend to status. Match the actual start and finish dates with the dates exported, as described in paragraph 3.3.5. Provide a computer with the scheduling software loaded and a projector during the meeting which allows all meeting participants to view the proposed schedule update during the meeting. The meeting and resultant approvable schedule update shall be a condition precedent to a formal submission of the update as described in SUBMISSION REQUIREMENTS and to the submission of an invoice for payment. The meeting will be a working interactive exchange which will allow the Government and the Contractor the opportunity review the updated schedule on a real time and interactive basis. The Contractor's authorized scheduling representative will organize, sort, filter and schedule the update as requested by the Government. The meeting will last no longer than 8 hours. A rough draft of the proposed activity logic corrections and narrative report shall be provided to the Government 48 hours in advance of the meeting. The Contractor's Project Manager and Authorized Scheduler shall attend the meeting with the Authorized Representative of the Contracting Officer.

## 3.6.1. Update Submission Following Progress Meeting

Submit a complete update of the project schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 working days after the periodic schedule update meeting, reflecting only those changes made during the previous update meeting.

## 3.6.2. Status of Activities

Update statusing information, including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD) and Percent Complete shall be subject to the approval of the Government prior to the meeting. As a minimum, address the following items on an activity by activity basis during each progress meeting:

## 3.6.2.1. Actual Start and Finish Dates

Accurately status the AS and/or AF dates for each activity currently in-progress or completed since the last update. The Government may allow an AF date to be assigned with the percent complete less than 100% to account for the value of work remaining but not restraining successor activities. Only assign AS dates when actual progress occurs on an activity.

## 3.6.2.2. Remaining Duration

Update the estimated RD for all incomplete activities independent of Percent Complete. Remaining durations may exceed the activity OD or may exceed the activity's prior update RD if the Government considers the current OD or RD to be understated based on current progress, insufficient work crews actually manning the job, unrealistic OD or deficiencies that must be corrected that restrain successor activities.

3.6.2.3. Percent Complete

Section: 01 32 01.00 10

Update the percent complete for each activity started based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be statused 100 percent complete. To allow for proper schedule management, cost load the correction of punch list from Government pre-final inspection activity(ies) not less than 1% of the total contract value, which activity(ies) may be declared 100 percent complete upon completion and correction of all punch list work identified during Government pre-final inspection(s).

## 3.6.2.4. Logic Changes

Specifically identify and discuss all logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, and other changes that have been made pursuant to contract provisions. The Government will only approve logic revisions for the purpose of keeping the schedule valid in terms of its usefulness in calculating a realistic completion date, correcting erroneous logic ties, and accurately sequencing the work.

## 3.6.2.5. Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule that does not represent the actual or planned prosecution and progress of the work.

## 3.7. REQUESTS FOR TIME EXTENSIONS

In the event the Contractor believes it is entitled to an extension of the contract performance period, completion date, or any interim milestone date, furnish the following for a determination by the Contracting Officer: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of excusable delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is a condition precedent to any approvals by the Government. In response to each Request For Proposal issued by the Government, the Contractor shall submit a schedule impact analysis demonstrating whether or not the change contemplated by the Government impacts the critical path.

## 3.7.1. Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with its request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

## 3.7.2. Submission Requirements

Submit a justification for each request for a change in the contract completion date of less than 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

- Section: 01 32 01.00 10
- 3.7.2.1. A list of affected activities, with their associated project schedule activity number.
- 3.7.2.2. A brief explanation of the causes of the change
- 3.7.2.3. An analysis of the overall impact of the changes proposed.
- 3.7.2.4. A sub-network of the affected area

Identify activities impacted in each justification for change by a unique activity code contained in the required data file.

## 3.7.3. Additional Submission Requirements

The Contracting Officer may request an interim update with revised activities for any requested time extension of over 2 weeks. Provide this disk within 4 days of the Contracting Officer's request.

- 3.7.4. If Progress Falls Behind the Approved Project Schedule
- 3.7.4.1. Should progress fall behind the approved schedule (more than 20 work days of negative float) due to Contractor generated problems, promptly provide a supplemental recovery or completion schedule that illustrates its efforts to regain time to assure a completion by the required contract completion date.
- 3.7.4.2. The supplemental recovery or completion schedule will not replace the original, approved schedule as the official contract schedule. Continue to update the original, approved schedule on at least a monthly basis. In addition, the Contractor and the Contracting Officer will monitor the supplemental recovery or completion schedule on at least a bi-weekly basis to determine its effect on regaining the rate of progress to assure project completion by the contractually required completion date.
- 3.7.4.3. Do not artificially improve progress by simply revising the schedule logic, modifying or adding constraints, or shortening future work activity durations. Resource and manpower load the supplemental recovery schedule or completion schedule with crew size and productivity for each remaining activity, indicating overtime, weekend work, and/or double shifts needed to regain the schedule, in accordance with FAR 52.236.15, without additional cost to the Government. Indicate assumptions made and the basis for any logic, constraint, or duration changes used in the creation of the supplemental recovery or completion schedule in a narrative submitted for the Contracting Officer's approval. Any additional resources or manpower must be evident at the work site. Do not modify the official contract schedule to include these assumptions.
- 3.7.4.4. Failure to perform work and maintain progress in accordance with the supplemental recovery or completion schedule may result in an interim and final unsatisfactory performance rating and/or may result in corrective action by the Contracting Officer in accordance with FAR 52.236-15.

## 3.8. DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The Contracting Officer will approve proposed revisions to the schedule prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the

Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

#### 3.9. WEEKLY PROGRESS MEETINGS

- 3.9.1. The Government and the Contractor shall meet weekly (or as otherwise mutually agreed to) between the meetings described in paragraph PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. The then current and approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The Contractor's Project Manager and the Authorized Representative of the Contracting Officer shall attend. The weekly progress meeting will address the status of RFI's, RFP's and Submittals.
- 3.9.2. Provide a bar chart produced by the scheduling software, organized by Total Float and Sorted by Early Start Date, and a two week "look-ahead" schedule by filtering all schedule activities to show only current ongoing activities and activities schedule to start during the upcoming two weeks, organized by Work Area Code (AREA) and sorted by Early Start Date.
- 3.9.3. The Government and the Contractor shall jointly review the reports. If it appears that activities on the longest path(s) which are currently driving the calculated completion date (driving activities), are not progressing satisfactorily and therefore could jeopardize timely project completion, corrective action must be taken immediately. Corrective action includes but is not limited to: increasing the number of work crews; increasing the number of work shifts; increasing the number of hours worked per shift; and determining if Government responsibility coded activities require Government corrective action.

#### 3.10. OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

## 3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

Download and upload the schedule data into the Resident Management System (RMS) prior to RMS databases being transferred to the Government and is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 - Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 - Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and electronic export from QCS of the application for progress payment.

End of Section 01 32 01.00 10

## SECTION 01 33 00 SUBMITTAL PROCEDURES

- 1.1. DEFINITIONS
- 1.2. NOT USED
- 1.3. SUBMITTAL CLASSIFICATION
- 1.4. APPROVED OR CONCURRED WITH SUBMITTALS
- 1.5. DISAPPROVED SUBMITTALS
- 1.6. WITHHOLDING OF PAYMENT
- 1.7. GENERAL
- 1.8. SUBMITTAL REGISTER
- 1.9. SCHEDULING
- 1.10. TRANSMITTAL FORM (ENG FORM 4025)
- 1.11. SUBMITTAL PROCEDURES
- 1.12. CONTROL OF SUBMITTALS
- 1.13. GOVERNMENT APPROVED SUBMITTALS
- 1.14. INFORMATION ONLY SUBMITTALS
- 1.15. STAMPS

Page 135 of 947

## Section: 01 33 00

## 1.0 GENERAL

## 1.1. DEFINITIONS

#### 1.1.1. Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

## 1.1.2. Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows.

## SD-01 Preconstruction Submittals

- Certificates of insurance.
- Surety bonds.
- List of proposed subcontractors.
- List of proposed products.
- Construction Progress Schedule.
- Submittal register.
- Schedule of prices.
- Accident Prevention Plan.
- Work plan.
- Quality control plan.
- Environmental protection plan.

#### SD-02 Shop Drawings

- Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
- Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.
- Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

## SD-03 Product Data

- Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.
- Samples of warranty language when the contract requires extended product warranties.

## SD-04 Samples

- Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
- Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
- Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those which will be removed at conclusion of the work.

## SD-05 Design Data

- Calculations, mix designs, analyses or other data pertaining to a part of work.
- Design submittals, design substantiation submittals and extensions of design submittals.

## SD-06 Test Reports

Section: 01 33 00

- Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)
- Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.
- Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- Investigation reports.
- Daily checklists.
- Final acceptance test and operational test procedure.

## SD-07 Certificates

- Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
- Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.
- Confined space entry permits.
- Text of posted operating instructions.

#### SD-08 Manufacturer's Instructions

• Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

## SD-09 Manufacturer's Field Reports

- Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- Factory test reports.

## SD-10 Operation and Maintenance Data

■ Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

## SD-11 Closeout Submittals

• Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

## 1.1.3. Approving Authority

Office authorized to approve submittal.

#### 1.1.4. Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

## 1.2. NOT USED

## 1.3. SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

Section: 01 33 00

- 1.3.1. Designer of Record Approved (DA)
- 1.3.1.1. Designer of Record (DOR) approval is required for all extensions of design, critical materials, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". Provide the Government the number of copies designated hereinafter of all DOR approved submittals, after the DOR has taken appropriate action. The DOR shall ensure that submittals conform to the Solicitation, the Accepted Proposal and the completed design, however see below for those submittals proposing a deviation to the contract or a substitution of a material, system, or piece of equipment that was identified by manufacturer, brand name or model description in the accepted contract proposal.
- 1.3.1.2. The DOR shall ensure that the submittals comply with all applicable Buy American Act and Trade Agreement Act clauses in the contract. The DOR may confer with the Contracting Officer's Representative for advice and interpretation of those clauses, as necessary.
- 1.3.1.3. The Government may, but is not required to, review any or all DOR approved submittals for conformance to the solicitation, accepted proposal and the completed design. Except for submittals designated as deviating from the Solicitation, the Accepted Proposal or completed design, the Contractor may proceed with acquisition and installation upon DOR approval. Government Approved (GA)
- 1.3.2. Government Approved (GA)

Government approval is required for any item specifically designated as requiring Government approval in the Solicitation, for internal and external color finish selections and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.3.3. Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the solicitation. Section 01 33 16 **DESIGN AFTER AWARD** covers the design submittal and review process in detail. Review will be only for conformance with the applicable codes, standards and contract requirements. Design data includes the design documents described in Section 01 33 16 **DESIGN AFTER AWARD**. Generally, design submittals should be identified as SD-05 Design Data submittals.

- 1.3.4. Designer of Record Approved/Government Conformance Review (DA/CR)
- 1.3.4.1. Deviations to the Accepted Design. Designer of Record approval and the Government's concurrence are required for any proposed deviation from the accepted design which still complies with the contract (the Solicitation and Accepted Proposal) before the Contractor is authorized to proceed with material acquisition or installation. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings." If necessary to facilitate the project schedule, the Contractor and the DOR may discuss a submittal proposing a deviation with the Contracting Officer's Representative prior to officially submitting it to the Government. However, the Government reserves the right to review the submittal before providing an opinion, if it deems it necessary. In any case, the Government will not formally agree to or provide a preliminary opinion on any deviation without the DOR's approval or recommended approval. The Government reserves the right to non-concur with any deviation from the design, which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed and concurred design.

1.3.4.2. Substitutions. Unless prohibited or provided for otherwise elsewhere in the Contract, where the accepted contract proposal named products, systems, materials or equipment by manufacturer, brand name and/or by model number or other specific identification, and the Contractor desires to substitute manufacturer or model after award, submit a requested substitution for Government concurrence. Include substantiation, identifying information and the DOR's approval, as meeting the contract requirements and that it is equal in function, performance, quality and salient features to that in the accepted contract proposal.

## 1.3.5. Designer of Record Approved/Government Approved (DA/GA)

Any proposed deviation to the solicitation and/or the accepted proposal constitutes a change to the contract. In addition to the above stated requirements for proposed deviations to the accepted design, both Designer of Record and Government Approval and, where applicable, a contract modification are required before the Contractor is authorized to proceed with material acquisition or installation for any proposed deviation to the contract. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Government reserves the right to accept or reject any such proposed deviation at its discretion.

## 1.3.6. Information Only

All submittals not requiring Designer of Record or Government approval will be for information only. Provide the Government "For Information Only" copies of all submittals not requiring Government approval or concurrence, after the Designer of Record has taken the appropriate action.

#### 1.4. APPROVED OR CONCURRED WITH SUBMITTALS

Do not construe the Contracting Officer's approval of or concurrence with submittals as a complete check, but only that design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval or concurrence will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work. The Government won't consider re-submittals for the purpose of substituting previously approved materials or equipment unless accompanied by an explanation of why a substitution is necessary.

## 1.5. DISAPPROVED SUBMITTALS

Make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Resubmit any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, provide prompt notice in accordance with the Contract Clause "Changes" to the Contracting Officer.

## 1.6. WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

#### 1.7. GENERAL

Make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, the Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, shall check, approve, sign, and stamp all items, indicating action taken. Clearly idenify proposed deviations from the contract requirements. Include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Schedule and make submittals requiring Government approval prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples remaining upon completion of the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

## 1.8. SUBMITTAL REGISTER (GA)

Develop a complete list of submittals, including each separate design package submittal. Submit the initial submittal register within 15 days after Notice to Proceed, including, as a minimum, the design packages and other initial submittals required elsewhere in the contract. The Designer of Record shall identify required submittals in the specifications, and use the list to prepare the Submittal Register, utilizing the government-provided software, QCS (see Section 01 45 01.10), to create the ENG Form 4288. Appendix R is a preliminary submittal register input form for use with the Quality Management System and the Resident Office Management System (QCS and RMS). The Government will provide the Contractor the actual Excel Spreadsheet version of this sample input form after award to modify and to use for input into QCS. The Excel Spreadsheet is not totally inputable into QCS, so additional keystroke input will be necessary. The sample input form is not all-inclusive. In addition, additional submittals may be required by other parts of the contract. After award, the parties will meet to discuss contract specific (or task order specific for a task order contract) distribution for the submittals all-inclusive and additional submittals may be required by other parts of the contract. Develop and complete the submittal register as the design is completed. Submit it to the Contracting Officer with the un-reviewed final design package submission or as soon as the design specifications are completed, if before the final design submission. When applicable, if the Contractor elects to fast track design and construction, using multiple design package submissions, update the submittal register to reflect the submittals associated with each design submission, clearly denoting all revisions to the previous submission. The submittal register serves as a scheduling document for submittals and for control of submittal actions throughout the contract period. Coordinate the submit dates and need dates used in the submittal register with dates in the Contractor prepared progress schedule. Submit monthly updates to the submittal register showing the Contractor action codes and actual dates with Government action codes and actual dates or until all submittals have been satisfactorily completed. Revise and submit the submittal register when revising the progress schedule.

## 1.9. SCHEDULING

Schedule submittals covering component items forming a system or items that are interrelated to be coordinated and submitted concurrently. Schedule certifications to be submitted with the pertinent drawings. Allow adequate time (a minimum of 15 calendar days exclusive of mailing time) and show on the register for those items requiring Government approval or concurrence. No delay damages or time extensions will be allowed for time lost in late submittals by the Contractor.

## 1.10. TRANSMITTAL FORM (ENG FORM 4025)

Use the transmittal form (ENG Form 4025) for submitting submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor or are included in the QCS software if the Contractor is required to use QCS for this contract. Use a separate transmittal form for each specification section Complete this form by filling out all the heading blank spaces and identify

each item submitted. Exercise special care to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

## 1.11. SUBMITTAL PROCEDURES

Make submittals as follows:

#### 1.11.1. Procedures

The Government will further discuss detailed submittal procedures with the Contractor at the Post-Award Conference.

#### 1.11.2. Deviations

For submittals which include proposed deviations requested by the Contractor, check the column "variation" of ENG Form 4025. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

## 1.12. CONTROL OF SUBMITTALS

Carefully control his procurement operations to ensure that each individual submittal is made on or before the scheduled submittal date shown on the approved "Submittal Register."

## 1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

Upon completion of review of submittals requiring Government approval or concurrence, the Government will stamp and date the submittals as approved or concurred.. The Government will retain two (2) copies of the submittal and return one (1) copy(ies) of the submittal.

## 1.14. INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. The Government will retain two (2) copies of information only submittals.

## 1.15. STAMPS

Use stamps similar to the following on the submittal data to certify that the submittal meets contract requirements:

	CONTRACTOR
	(FIRM NAME)
Approved	

W912QR-23413770 CERTIFIED FINAL-003 Page 141 of 947

	Approved with corrections as noted on submittal data and/or attached sheet(s)
Signature:	
Title:	
Date:	
Title:	

Section: 01 33 00

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

## SECTION 01 33 16 DESIGN AFTER AWARD

1.0	GENERAL INFORMATION
1.1.	INTRODUCTION
1.2.	DESIGNER OF RECORD
2.0	PRODUCTS (Not Applicable)
3.0	EXECUTION
3.1.	PRE-WORK ACTIVIES & CONFERENCES
3.1.1.	Design Quality Control Plan
3.1.2.	Post Award Conference
3.1.3.	Partnering & Project Progress Processes
3.1.4.	Initial Design Conference
3.1.5.	Pre-Construction Conference
3.2.	STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS
3.2.1.	Site/Utilities
3.2.2.	Interim Design Submittals
3.2.3.	Over-the-Shoulder Progress Reviews
3.2.4.	Final Design Submissions
3.2.5.	Design Complete Submittals
3.2.6.	Holiday Periods for Government Review or Actions
3.2.7.	Late Submittals and Reviews
3.3.	DESIGN CONFIGURATION MANAGEMENT
3.3.1.	Procedures
3.3.2.	Tracking Design Review Comments
3.3.3.	Design and Code Checklists
3.4.	INTERIM DESIGN REVIEWS AND CONFERENCES
3.4.1.	General
3.4.2.	Procedures

3.4.3.	Conference Documentation				
3.5.	INTERIM DESIGN REQUIREMENTS				
3.5.1.	Drawings				
3.5.2.	Design Analyses				
3.5.3.	Geotechnical Investigations and Reports				
3.5.4.	LEED Documentation				
3.5.5.	Energy Conservation				
3.5.6.	Specifications				
3.5.7.	Building Rendering				
3.5.8.	Interim Building Design Contents				
3.6.	FINAL DESIGN REVIEWS AND CONFERENCES				
3.7.	FINAL DESIGN REQUIREMENTS				
3.7.1.	Drawings				
3.7.2.	Design Analysis				
3.7.3.	Specifications				
3.7.4.	Submittal Register				
3.7.5.	Preparation of DD Form 1354 (Transfer of Real Property)				
3.7.6.	Acceptance and Release for Construction				
3.8.	DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS				
3.9.	SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES				
3.9.1.	Submittal Distribution and Quantities				
3.9.2.	Web based Design Submittals				
3.9.3.	Mailing of Design Submittals				
3.10.	AS-BUILT DOCUMENTS				
ATTACHM	ENT A STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS				
ATTACHMENT B FURNITURE, FIXTURES AND EQUIPMENT REQUIREMENTS					
ATTACHMENT C TRACKING COMMENTS IN DRCHECKS					

ATTACHMENT D SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW

### **ATTACHMENT E LEED SUBMITTALS**

ATTACHMENT F BUILDING INFORMATION MODELING REQUIREMENTS

ATTACHMENT G DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT

**GENERAL INFORMATION** 

### 1.1. INTRODUCTION

Section: 01 33 16

1.0

- 1.1.1. The information contained in this section applies to the design required after award. After award, the Contractor will develop the accepted proposal into the completed design, as described herein.
- 1.1.2. The Contractor may elect to fast track the design and construction that is, proceed with construction of parts of the sitework and facilities prior to completion of the overall design. To facilitate fast tracking, the Contractor may elect to divide the design into no more than six (6) design packages per major facility type and no more than three (3) design packages for site and associated work. Designate how it will package the design, consistent with its overall plan for permitting (where applicable) and construction of the project. See Sections 01 33 00 SUBMITTAL PROCEDURES and 01 32 01.00 10 PROJECT SCHEDULE for requirements for identifying and scheduling the design packaging plan in the submittal register and project schedule. See also Sections 01 10 00 STATEMENT OF WORK and 01 57 20.00 10 ENVIRONMENTAL PROTECTION for any specified permit requirements. If early procurement of long-lead item construction materials or installed equipment, prior to completion of the associated design package, is necessary to facilitate the project schedule, also identify those long-lead items and how it will assure design integrity of the associated design package to meet the contract requirements (The Contract consists of the Solicitation requirements and the accepted proposal). Once the Government is satisfied that the long-lead items meet the contract requirements, the Contracting Officer will allow the Contractor to procure the items at its own risk.
- 1.1.3. The Contractor may proceed with the construction work included in a separate design package after the Government has reviewed the final (100%) design submission for that package, review comments have been addressed and resolved to the Government's satisfaction and the Contracting Officer (or the Administrative Contracting Officer) has agreed that the design package may be released for construction.
- 1.1.4. INTEGRATED DESIGN. To the maximum extent permitted for this project, use a collaborative, integrated design process for all stages of project delivery with comprehensive performance goals for siting, energy, water, materials and indoor environmental quality and ensures incorporation of these goals. Consider all stages of the building lifecycle, including deconstruction.

### 1.2. DESIGNER OF RECORD

Identify, for approval, the Designer of Record ("DOR") that will be responsible for each area of design. One DOR may be responsible for more than one area. Listed, Professional Registered, DOR(s) shall account for all areas of design disciplines. The DOR's shall stamp, sign, and date each design drawing and other design deliverables under their responsible discipline at each design submittal stage (see contract clause Registration of Designers). If the deliverables are not ready for release for construction, identify them as "preliminary" or "not for release for construction" or by using some other appropriate designation. The DOR(s) shall also be responsible for maintaining the integrity of the design and for compliance with the contract requirements through construction and documentation of the as-built condition by coordination, review and approval of extensions of design, material, equipment and other construction submittals, review and approval or disapproval of requested deviations to the accepted design or to the contract, coordination with the Government of the above activities, and by performing other typical professional designer responsibilities.

### 2.0 PRODUCTS (Not Applicable)

### 3.0 EXECUTION

### 3.1. PRE-WORK ACTIVITIES & CONFERENCES

Design Quality Control Plan

Section: 01 33 16

3.1.1.

Submit for Government acceptance, a Design Quality Control Plan in accordance with Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL before design may proceed.

### 3.1.2. Post Award Conference

- 3.1.2.1. The government will conduct a post award contract administration conference at the project site, as soon as possible after contract award. This will be coordinated with issuance of the contract notice to proceed (NTP). The Contractor and major sub-contractor representatives shall participate. All designers need not attend this first meeting. Government representatives will include COE project delivery team members, facility users, facility command representatives, and installation representatives. The Government will provide an agenda, meeting goals, meeting place, and meeting time to participants prior to the meeting.
- 3.1.2.2. The post award conference shall include determination and introduction of contact persons, their authorities, contract administration requirements, discussion of expected project progress processes, and coordination of subsequent meetings for quality control (see Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL), Partnering (see below and SCR: Partnering), and the initial design conference (see below).
- 3.1.2.3. The government will introduce COE project delivery team members, facility users, facility command representatives, and installation representatives. The DB Contractor shall introduce major subcontractors, and other needed staff. Expectations and duties of each person shall be defined for all participants. A meeting roster shall be developed and distributed by the government with complete contact information including name, office, project role, phone, mailing and physical address, and email address.

### 3.1.3. Partnering & Project Progress Processes

- 3.1.3.1. The initial Partnering conference may be scheduled and conducted at any time with or following the post award conference. The Government proposes to form a partnership with the DB Contractor to develop a cohesive building team. This partnership will involve the COE project delivery team members, facility users, facility command representatives, installation representatives, Designers of Record, major subcontractors, contractor quality control staff, and contractor construction management staff. This partnership will strive to develop a cooperative management team drawing on the strengths of each team member in an effort to achieve a quality project within budget and on schedule. This partnership will be bilateral in membership and participation will be totally voluntary. All costs, excluding labor and travel expenses, shall be shared equally between the Government and the Contractor. The Contractor and Government shall be responsible for their own labor and travel costs. Normally, partnering meetings will be held at or in the vicinity of the project installation.
- 3.1.3.2. As part of the partnering process, the Government and Contractor shall develop, establish, and agree to comprehensive design development processes including conduct of conferences, expectations of design development at conferences, fast-tracking, design acceptance, Structural Interior Design (SID)/Furniture, Fixtures & Equipment (FF&E) design approval, project closeout, etc. The government will explain contract requirements and the DB Contractor shall review their proposed project schedule and suggest ways to streamline processes.

### 3.1.4. Initial Design Conference

The initial design conference may be scheduled and conducted at the project installation any time after the post award conference, although it is recommended that the partnering process be initiated with or before the initial design conference. Any design work conducted after award and prior to this conference should be limited to site and is discouraged for other items. All Designers of Record shall participate in

the conference. The purpose of the meeting is to introduce everyone and to make sure any needs the contractor has are assigned and due dates established as well as who will get the information. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning the BIM Implementation Plan demonstration at this meeting. The DB Contractor shall conduct the initial design conference.

### 3.1.5. Pre-Construction Conference

Before starting construction activities, the Contractor and Government will jointly conduct a preconstruction administrative conference to discuss any outstanding requirements and to review local installation requirements for start of construction. It is possible there will be multiple Pre-Construction Conferences based on the content of the design packages selected by the Contractor. The Government will provide minutes of this meeting to all participants.

### 3.2. STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS

The stages of design submittals described below define Government expectations with respect to process and content. The Contractor shall determine how to best plan and execute the design and review process for this project, within the parameters listed below. As a minimum, the Government expects to see at least one interim design submittal, at least one final design submittal before construction of a design package may proceed and at least one Design Complete submittal that documents the accepted design. The Contractor may sub-divide the design into separate packages for each stage of design and may proceed with construction of a package after the Government accepts the final design for that package. See discussion on waivers to submission of one or more intermediate design packages where the parties partner during the design process. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning BIM and the various stages of design submittals and over-the-shoulder progress reviews.

### 3.2.1. Site/Utilities

To facilitate fast-track design-construction activities the contractor may submit a final (100%) site and utility design as the first design submittal or it may elect to submit interim and final site and utility design submittals as explained below. Following review, resolution, and incorporation of all Government comments, and submittal of a satisfactory set of site/utility design documents, after completing all other pre-construction requirements in this contract and after the pre-construction meeting, the Government will allow the Contractor to proceed with site development activities, including demolition where applicable, within the parameters set forth in the accepted design submittal. For the first site and utility design submission, whether an interim or final, the submittal review, comment, and resolution times from this specification apply, except that the Contractor shall allow the Government a 14 calendar day review period, exclusive of mailing time. No on-site construction activities shall begin prior to written Government clearance to proceed.

### 3.2.2. Interim Design Submittals

The Contractor may submit either a single interim design for review, representing a complete package with all design disciplines, or split the interim design into smaller, individual design packages as it deems necessary for fast-track construction purposes. As required in Section 01 32 01.00 10 PROJECT SCHEDULE, the Contractor shall schedule its design and construction packaging plan to meet the contract completion period. This submission is the Government's primary opportunity to review the design for conformance to the solicitation and to the accepted contract proposal and to the Building Codes at a point where required revisions may be still made, while minimizing lost design effort to keep the design on track with the contract requirements. The requirements for the interim design review submittals and review conferences are described hereinafter. This is not necessarily a hold point for the design process; the Contractor may designate the interim design submittal(s) as a snapshot and proceed with design development at its own risk. See below for a waiver, where the parties establish an effective

over-the-shoulder progress review procedure through the partnering process that would eliminate the need for or expedite a formal intermediate design review on one or more individual design packages.

### 3.2.3. Over-the-Shoulder Progress Reviews

To facilitate a streamlined design-build process, the Government and the Contractor may agree to oneon-one reviewer or small group reviews, electronically, on-line (if available within the Contractor's standard design practices) or at the Contractor's design offices or other agreed location, when practicable to the parties. The Government and Contractor will coordinate such reviews to minimize or eliminate disruptions to the design process. Any data required for these reviews shall normally be provided in electronic format, rather than in hard copy. If the Government and Contractor establish and implement an effective, mutually agreeable partnering procedure for regular (e.g., weekly) over-the shoulder review procedures that allow the Government reviewers the opportunity to keep fully informed of the progress. contents, design intent, design documentation, etc. of the design package, the Government will agree to waive or to expedite the formal intermediate design review period for that package. The Contractor shall still be required to submit the required intermediate design documentation, however the parties may agree to how that material will be provided, in lieu of a formal consolidated submission of the package. It should be noted that Government funding is extremely limited for non-local travel by design reviewers, so the maximum use of virtual teaming methods must be used. Some possible examples include electronic file sharing, interactive software with on-line or telephonic conferencing, televideo conferencing, etc. The Government must still perform its Code and Contract conformance reviews, so the Contractor is encouraged to partner with the reviewers to find ways to facilitate this process and to facilitate meeting or bettering the design-build schedule. The Contractor shall maintain a fully functional configuration management system as described herein to track design revisions, regardless of whether or not there is a need for a formal intermediate design review. The formal intermediate review procedures shall form the contractual basis for the official schedule, in the event that the partnering process determines that the formal intermediate review process to be best suited for efficient project execution. However, the Government pledges to support and promote the partnering process to work with the Contractor to find ways to better the design schedule.

### 3.2.4. Final Design Submissions

This submittal is required for each design package prior to Government acceptance of that design package for construction. The requirements for the final design submittal review conferences and the Government's acceptance for start of construction are described herein after.

### 3.2.5. Design Complete Submittals

After the final design submission and review conference for a design package, revise the design package to incorporate the comments generated and resolved in the final review conferences, perform and document a back-check review and submit the final, design complete documents, which shall represent released for construction documents. The requirements for the design complete submittals are described hereinafter.

### 3.2.6. Holiday Periods for Government Review or Actions

Do not schedule meetings, Government reviews or responses during the last two weeks of December or other designated Government Holidays (including Friday after Thanksgiving). Exclude such dates and periods from any durations specified herein for Government actions.

### 3.2.7. Late Submittals and Reviews

If the Contractor cannot meet its scheduled submittal date for a design package, it must revise the proposed submittal date and notify the government in writing, at least one (1) week prior to the submittal, in order to accommodate the Government reviewers' other scheduled activities. If a design submittal is

over one (1) day late in accordance with the latest revised design schedule, or if notification of a proposed design schedule change is less than seven (7) days from the anticipated design submission receipt date, the Government review period may be extended up to seven (7) days due to reviewers' schedule conflicts. If the Government is late in meeting its review commitment and the delay increases the Contractor's cost or delays completion of the project, the Suspension of Work and Defaults clauses provide the respective remedy or relief for the delay.

### 3.3. DESIGN CONFIGURATION MANAGEMENT

### 3.3.1. Procedures

Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. During the design process, this will facilitate and help streamline the design and review schedule. After the final design is accepted, this process provides control of and documents revisions to the accepted design (See Special Contract Requirement: Deviating From the Accepted Design). The system shall include appropriate authorities and concurrences to authorize revisions, including documentation as to why the revision must be made. Include the DCM procedures in the Design Quality Control Plan. The DCM data shall be available to the Government reviewers at all times. The Contractor may use its own internal system with interactive Government concurrences, where necessary or may use the Government's "DrChecks Design Review and Checking System" (see below and Attachment C).

### 3.3.2. Tracking Design Review Comments

Although the Contractor may use its own internal system for overall design configuration management, the Government and the Contractor shall use the DrChecks Design Review and Checking System to initiate, respond to, resolve and track Government design compliance review comments. This system may be useful for other data which needs to be interactive or otherwise available for shared use and retrieval. See Attachment C for details on how to establish an account and set-up the DrChecks system for use on the project.

### 3.3.3. Design and Code Checklists

Develop and complete various discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists with each design submittal, as applicable, as part of the project documentation. See Section 01 45 04.00 10 Contractor Quality Control, Attachment D for a Sample Fire Protection and Life Safety Code review checklist and Attachment E for LEED SUBMITTALS.

### 3.4. INTERIM DESIGN REVIEWS AND CONFERENCES

### 3.4.1. General

At least one interim design submittal, review and review conference is required for each design package (except that, per paragraph 3.2.1, the Contractor may skip the interim design submission and proceed directly to final design on the sitework and utilities package). The DB Contractor may include additional interim design conferences or over-the-shoulder reviews, as needed, to assure continued government concurrence with the design work. Include the interim submittal review periods and conferences in the project schedule and indicate what part of the design work is at what percentage of completion. The required interim design conferences shall be held when interim design requirements are reached as described below. See also Paragraph: **Over-the-Shoulder Progress Reviews** for a waiver to the formal interim design review.

### 3.4.2. Procedures

After receipt of an Interim Design submission, allow the Government fourteen (14) calendar days after receipt of the submission to review and comment on the interim design submittal. For smaller design packages, especially those that involve only one or a few separate design disciplines, the parties may agree on a shorter review period or alternative review methods (e.g., over-the-shoulder or electronic file sharing), through the partnering process. For each interim design review submittal, the COR will furnish. to the Contractor, a single consolidated, validated listing of all comments from the various design sections and from other concerned agencies involved in the review process using the DrChecks Design Review and Checking System. The review will be for conformance with the technical requirements of the solicitation and the Contractor's RFP proposal. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he/she must clearly outline, with ample justification, the reasons for noncompliance within five (5) days after receipt of these comments in order that the comment can be resolved. Furnish disposition of all comments, in writing, through DrChecks. The Contractor is cautioned that if it believes the action required by any comment exceeds the requirements of this contract, that it should take no action and notify the COR in writing immediately. The Interim Review conference will be held for each design submittal at the installation. Bring the personnel that developed the design submittal to the review conference. The conference will take place the week after the receipt of the comments by the Contractor. For smaller fast-track packages that involve only a few reviewers, the parties may agree to alternative conferencing methods, such as teleconferencing, or televideo, where available, as determined through Partnering.

### 3.4.3. Conference Documentation

- 3.4.3.1. In order to facilitate and accelerate the Government code and contract conformance reviews, identify, track resolution of and maintain all comments and action items generated during the design process and make this available to the designers and reviewers prior to the Interim and subsequent design reviews.
- 3.4.3.2. The DB Contractor shall prepare meeting minutes and enter final resolution of all comments into DrChecks. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Incorporate valid comments. The Government reserves the right to reject design document submittals if comments are significant. Participants shall determine if any comments are critical enough to require further design development prior to government concurrence. Participants shall also determine how to proceed in order to obtain government concurrence with the design work presented.

### 3.5. INTERIM DESIGN REQUIREMENTS

Interim design deliverables shall include drawings, specifications, and design analysis for the part of design that the Contractor considers ready for review.

### 3.5.1. Drawings

Include comments from any previous design conferences incorporated into the documents to provide an interim design for the "part" submitted.

### 3.5.2. Design Analyses

- 3.5.2.1. The designers of record shall prepare and present design analyses with calculations necessary to substantiate and support all design documents submitted. Address design substantiation required by the applicable codes and references and pay particular attention to the following listed items:
- 3.5.2.2. For parts including sitework, include site specific civil calculations.
- 3.5.2.3. For parts including structural work, include structural calculations.

- (a) Identify all loads to be used for design.
- (b) Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.
- (c) Provide calculations for all principal roof, floor, and foundation members and bracing and secondary members.
- (d) Provide complete seismic analyses for all building structural, mechanical, electrical, architectural, and building features as dictated by the seismic zone for which the facility is being constructed.
- (e) Computer generated calculations must identify the program name, source, and version. Provide input data, including loads, loading diagrams, node diagrams, and adequate documentation to illustrate the design. The schematic models used for input must show, as a minimum, nodes/joints, element/members, materials/properties, and all loadings, induced settlements/deflections, etc., and a list of load combinations. Include an output listing for maximum/minimum stresses/forces and deflections for each element and the reactions for each loading case and combination.
- (f) See also the Security (Anti-Terrorism) requirements below for members subject to Anti-Terrorist Force Protection (ATFP) and Progressive Collapse requirements.
- (g) Fully coordinate and integrate the overall structural design between two different or interfacing construction types, such as modular and stick-built or multistory, stacked modular construction. Provide substantiation of structural, consolidation/settlement analysis, etc., as applicable, through the interfaces.
- 3.5.2.4. For Security (Anti-Terrorism): Provide a design narrative and calculations where applicable, demonstrating compliance with each of the 22 standards in UFC 4-010-01, which includes Design of Buildings to Resist Progressive Collapse (use the most recent version of UFC 4-023-03, regardless of references to any specific version in UFC 4-010-01). Where sufficient standoff distance is not being provided, show calculations for blast resistance of the structural system and building envelope. Show complete calculations for members subjected to ATFP loads, e.g., support members of glazed items (jambs, headers, sills) connections of windows to support members and connections of support members to the rest of the structure. For 3 story and higher buildings, provide calculations to demonstrate compliance with progressive collapse requirements.
- 3.5.2.5. For parts including architectural work, include building floor area analysis.
- 3.5.2.6. For parts including mechanical work, include HVAC analysis and calculations. Include complete design calculations for mechanical systems. Include computations for sizing equipment, compressed air systems, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation is required (see paragraph 3.5.5.2 for list of acceptable software). Based on the results of calculations, provide a complete list of the materials and equipment proposed with the manufacturer's published cataloged product installation specifications and roughing-in data.
- 3.5.2.7. For parts including life safety, include building code analysis and sprinkler and other suppression systems. Notwithstanding the requirements of the Codes, address the following:
- (a) A registered fire protection engineer (FPE) must perform all fire protection analyses. Provide the fire protection engineer's qualifications. See Section 01 10 00, paragraph 5 for qualifications.
- (b) Provide all references used in the design including Government design documents and industry standards used to generate the fire protection analysis.
- (c) Provide classification of each building in accordance with fire zone, building floor areas and height and number of stories.

(d) Provide discussion and description of required fire protection requirements including extinguishing equipment, detection equipment, alarm equipment and water supply. Alarm and detection equipment shall interface to requirements of Electronic Systems.

- (e) Provide hydraulic calculations based on water flow test for each sprinkler system to insure that flow and pressure requirements can be met with current water supply. Include copies of Contractor's water flow testing done to certify the available water source.
- 3.5.2.8. For parts including plumbing systems:
- (a) List all references used in the design.
- (b) Provide justification and brief description of the types of plumbing fixtures, piping materials and equipment proposed for use.
- (c) Detail calculations for systems such as sizing of domestic hot water heater and piping; natural gas piping; LP gas piping and tanks, fuel oil piping and tanks, etc., as applicable.
- (d) When the geotechnical report indicates expansive soils are present, indicate in the first piping design submittal how piping systems will be protected against damage or backfall/backflow due to soil heave (from penetration of slab to the 5 foot building line).
- 3.5.2.9. For elevator systems:
- (a) List all criteria codes, documents and design conditions used.
- (b) List any required permits and registrations for construction of items of special mechanical systems and equipment.
- 3.5.2.10. For parts including electrical work, include lighting calculations to determine maintained foot-candle levels, electrical load analysis and calculations, electrical short circuit and protective device coordination analysis and calculations and arc fault calculations.
- 3.5.2.11. For parts including telecommunications voice/data (including SIPRNET, where applicable), include analysis for determining the number and placement of outlets
- 3.5.2.12. For Cathodic Protection Systems, provide the following stamped report by the licensed corrosion engineer or NACE specialist with the first design submission. The designer must be qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. He/she must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection Specialist, or must be a registered professional engineer with a minimum of five years experience in corrosion control and cathodic protection, Clearly describe structures, systems or components in soil or water to be protected. Describe methods proposed for protection of each.
- 3.5.2.13. Air Barrier System: Provide a narrative of the design and installation requirements for the Air Barrier system. As part of the design quality control process an air barrier consultant shall review drawing details to assure that details of critical Air Barrier components are properly detailed and incorporated during the design drawings and process (i.e. window flashing details, penetration in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.). Furnish the Government written review details and results.
- 3.5.2.14. Life Cycle Cost Analysis (LCCA) Documentation: Sufficient documentation is required for all life cycle cost analyses required in paragraph 5 of Section 01 10 00, the Statement of Work. Each LCCA must be complete and substantial, sufficient of being read as a standalone document which defines all the parameters of the analysis. Use of commercially available software programs to calculate life cycle costs are acceptable, however, provide the LCCA Documentation requirements, as outlined below in addition to any input/output documents generated by the software. As a minimum, include the following items in the LCCA documentation:

- Section: 01 33 16
- (a) Definition of Baseline Condition
- (b) Narrative Identification/Explanation of Each Alternative Considered
- (c) Energy Usage Analysis (Narrative explanation as well as computer outputs)
- (d) Energy Costs Used (Source of Rate Structure or Utility Rates)
- (e) First Cost of Baseline Condition and Each Alternative (Cost information must demonstrate inclusion of applicable components and sub-components single line, lump sum cost estimates for the baseline or alternative conditions are not acceptable)
- (f) Cyclical Replacement Costs (Identify data source for equipment/component life used)
- (g) Annual/Recurring Maintenance Costs (Identify data source for required maintenance tasks and duration/cost of tasks)
- (h) Salvage Values (Identify data source for equipment/component life used)
- (i) Life Cycle Cost Results Including:
- (1) Life Cycle Cost of the Baseline Condition
- (2) Life Cycle Cost of Each Alternative Evaluated
- (3) Simple Payback Calculations for Each Alternative
- (4) Savings to Investment Ratio for Each Alternative
- (5) Study Period Utilized
- (6) Net Savings for Each Alternative (As Applicable)
- (7) Narrative Discussion/Analysis of Results
- (8) Uncertainty Analysis
- (9) Certification that the analysis conducted and documented is compliant with the terms, instructions, and conditions of 10 CFR 436 Subpart A.

### 3.5.3. Geotechnical Investigations and Reports:

3.5.3.1. The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal. Make this information available as early as possible during the over-the-shoulder progress review process. Summarize the subsurface conditions and provide recommendations for the design of appropriate utilities, foundations, floor slabs, retaining walls, embankments, and pavements. Include compaction requirements for fill and backfill under buildings, sidewalks, other structures and open areas. Recommend foundation systems to be used. allowable bearing pressures for footings, lateral load resistance capacities for foundation systems, elevations for footings, grade beams, slabs, etc. Provide an assessment of post-construction settlement potential including total and differential. Provide recommendations regarding lateral earth pressures (active, at-rest, passive) to be used in the design of retaining walls. Include the recommended spectral accelerations and Site Class for seismic design along with an evaluation of any seismic hazards and recommendations for mitigation, if required. Include calculations to support the recommendations for bearing capacity, settlement, and pavement sections. Include supporting documentation for all recommended design parameters such as Site Class, shear strength, earth pressure coefficients, friction factors, subgrade modulus, California Bearing Ratio (CBR), etc. Provide earthwork recommendations, expected frost penetration, expected groundwater levels, recommendations for dewatering and groundwater control and the possible presence of any surface or subsurface features that may affect the construction of the project such as sinkholes, boulders, shallow rock, old fill, old structures, soft areas, or unusual soil conditions. Include pH tests, salinity tests, resistivity measurements, etc., required to design corrosion control and grounding systems. Include the raw field data. Arrange a meeting with the Government subsequent to completion and evaluation of the site specific geotechnical exploration to outline any differences encountered that are inconsistent with the Government provided preliminary soils

information. Clearly outline differences which require changes in the foundation type, or pavement and earthwork requirements from that possible and contemplated using the Government furnished preliminary soils investigation, which result in a change to the design or construction. Any equitable adjustment is subject to the provisions of the contract's Differing Site Conditions Clause.

- 3.5.3.2. Vehicle Pavements: The Contractor's geotechnical report shall contain flexible and rigid pavement designs, as applicable for the project, including design CBR and modulus of subgrade reaction and the required compaction effort for subgrades and pavement layers. Provide Information on the types of base course materials available in the area and design strengths.
- 3.5.3.3. The Contractor and the professional geotechnical engineer consultant shall certify in writing that the design of the project has been developed consistent with the Contractor's final geotechnical report. The certification shall be stamped by the consulting professional geotechnical engineer and shall be submitted with the first design submission. If revisions are made to the initial design submission, a new certification shall be provided with the final design submission.

### 3.5.4. LEED Documentation:

Assign a LEED Accredited Professional, responsible to track LEED planning, performance and documentation for each LEED credit through construction closeout. Incorporate LEED credits in the plans, specifications and design analyses. Develop LEED supporting documentation as a separable portion of the Design Analysis and provide with each required design submittal. Include the LEED Project checklist for each non-exempt facility (one checklist may be provided for multiple facilities in accordance with the LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects and the LEED SUBMITTALS (Attachment E, herein) with each submittal. Final design submittal for each portion of the work must include all required design documentation relating to that portion of work (example - all site credit design documents with final site design). Submittal requirements are as indicated in Attachment E, LEED SUBMITTALS. Submit all documentation indicated on Attachment E as due at final design at final design submittal (for fast-track projects with multiple final design submittals, this shall be at the last scheduled final design submittal). All project documentation related to LEED shall conform to USGBC requirements for both content and format, including audit requirements and be separate from other design analyses. Maintain and update the LEED documentation throughout project progress to construction closeout and shall compile product data, receipts, calculations and other data necessary to substantiate and support all credits claimed. The Government may audit any or all individual credits. Audit documentation is not required to be submitted unless requested. These requirements apply to all projects. If the project requires the Contractor to obtain USGBC certification, the Contractor shall also be responsible for obtaining USGBC certification and shall provide written evidence of certification with the construction closeout LEED documentation submittal. Install the USGBC building plaque at the location indicated by the Government upon receipt. If Contractor obtains USGBC interim design review, submit the USGBC review to the Government within 30 days of receipt for information only.

3.5.4.1. LEED Documentation for Technology Solution Set. If the Solicitation provides a Prescriptive Technology Solution Set, use of the Technology Solution set has no effect on LEED documentation requirements. Provide all required LEED documentation, including energy analysis, in accordance with LEED requirements when using the Technology Solution Set.

### 3.5.5. Energy Conservation:

3.5.5.1. Refer to Section 01 10 00, Paragraph 5. Interim and Final Design submittals shall demonstrate that each building including the building envelope, HVAC systems, service water heating, power, and lighting systems meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Use Compliance Documentation forms available from ASHRAE and included in the ASHRAE 90.1 User's Manual for this purpose. The Architectural Section of the Design Analysis shall include completed forms titled "Building Envelope Compliance Documentation Parts I and II". The Heating Ventilating and Air Conditioning (HVAC) Section of the Design Analysis shall include a completed form titled "HVAC Simplified Approach Option - Part I" if this approach is allowed by the Standard. Otherwise, the HVAC

Section of the Design Analysis shall include completed forms titled "HVAC Mandatory Provisions - Part II" and "HVAC Prescriptive Requirements - Part III". The Plumbing Section of the Design Analysis shall include a completed form titled "Service Water Heating Compliance Documentation". The Electrical Section of the Design Analysis shall include an explanatory statement on how the requirements of ASHRAE 90.1 Chapter 8 Power were met. The Electrical Section of the Design Analysis shall also include a completed form titled "Lighting Compliance Documentation".

3.5.5.2. Interim and Final Design submittals which address energy consuming systems, (heating, cooling, service hot water, lighting, power, etc.) must also include calculations in a separate Energy Conservation Section of the Design Analysis which demonstrate and document (a) the baseline energy consumption for the facility or facilities under contract, that would meet the requirements of ANSI/ASHRAE/IESNA Standard 90.1 and (b) the energy consumption of the facility or facilities under contract utilizing the materials and methods required by this construction contract. Use the USGBC Energy and Atmosphere (EA) Credit 1 compliance template / form or an equivalently detailed form for documenting compliance with the energy reduction requirements. This template / form is titled PERFORMANCE RATING METHOD and is available when the project is registered for LEED. The calculation methodology used for this documentation and analysis shall follow the guidelines set forth in Appendix G of ASHRAE 90.1, with two exceptions: a) receptacle and process loads may be omitted from the calculation; and b) the definition of the terms in the formula for Percentage Improvement found in paragraph G1.2 are modified as follows: Baseline Building Performance shall mean the annual energy consumption calculated for a building design intended for use as a baseline for rating above standard design meeting the minimum requirements of the energy standard, and Proposed Building Performance shall mean annual energy consumption calculated for the proposed building design intended for construction. This calculation shall address all energy consuming systems in a single integrated methodology. Include laboratory fume hoods and kitchen ventilation loads in the energy calculation. They are not considered process loads. Individual calculations for heating, cooling, power, lighting, power, etc. systems will not be acceptable. The following building simulation software is acceptable for use in calculating building energy consumption: Hourly Analysis Program (HAP) by Carrier Corp., TRACE 700 by Trane Corp., DOE-2 by US Department of Energy, EnergyPlus by DOD/DOE.

### 3.5.6. Specifications

Specifications may be any one of the major, well known master guide specification sources. Uuse only one source. Examples include specifications from MASTERSPEC from the American Institute of Architects, SPECTEXT from Construction Specification Institute or Unified Facility Guide Specifications (UFGS using MASTERFORMAT 2004 numbering system), etc. The UFGS are available through the "Whole Building Design Guide" website, using a websearch engine. Manufacturers' product specifications, utilizing CSI's Manu-Spec, three part format may be used in conjunction with the selected specifications. The designers of record shall edit and expand the appropriate Specifications to insure that all project design requirements, current code requirements, and regulatory requirements are met. Specifications shall clearly identify, where appropriate, specific products chosen to meet the contract requirements (i.e., manufacturers' brand names and model numbers or similar product information). Note that the UFGS are NOT written for Design-Build and must be edited appropriately. For instance, they assume that the Government will approve most submittals, whereas in Design-Build, the Designer of Record has that action, unless this Solicitation requires Government approval for specific submittals. The Designer of Record should also note that some UFGS sections might either prescribe requirements exceeding the Government's own design standards in applicable references or contain requirements that should be selected where appropriately required by the applicable references. At any rate, where the UFGS are consistent with other major, well known master commercial guide specifications, then generally retain such requirements, as good practices.

## 3.5.7. Building Rendering

Present and provide a draft color computer, artist, or hand drawn rendering with the conceptual design submittal of the building exterior. Perspective renderings shall include a slightly overhead view of the

entire building to encompass elevations and the roof configuration of the building. After Government review and acceptance, provide a final rendering, including the following:

Three (3) 18" x 24" color prints, framed and matted behind glass with project title underneath the print.

One (1) Image file (high resolution) in JPG format on CD for those in the submittal distribution list.

### 3.5.8. Interim Building Design Contents

The following list represents what the Government considers should be included in the overall completed design for a facility or project. It is not intended to limit the contractor from providing different or additional information as needed to support the design presented, including the require design analyses discussed above. As the Contractor develops individual design packages and submits them for Interim review, include as much of the applicable information for an individual design package as is developed at the Interim design level for review purposes. These pieces shall be developed as the design progresses toward the design complete stage.

- 3.5.8.1. Lawn and Landscaping Irrigation System
- 3.5.8.2. Landscape, Planting and Turfing
- 3.5.8.3. Architectural
- (a) Design Narrative
- (b) Architectural Floor Plans, Typical Wall and Roof Sections, Elevations
- (c) Finish schedule
- (d) All required equipment
- (e) Special graphics requirements
- (f) Door and Window Schedules
- (g) Hardware sets using BHMA designations
- (h) Composite floor plan showing all pre-wired workstations
- (i) Structural Interior Design (SID) package: See ATTACHMENT A for specific requirements
- (j) Furniture, Fixtures & Equipment (FF&E) design package: See ATTACHMENT B for specific requirements
- (k) Air Barrier Design: Details of all Air Barrier components, (i.e. window flashing details, penetrations in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.)
- 3.5.8.4. Structural Systems. Include:
- (a) Drawings showing principal members for roof and floor framing plans as applicable
- (b) Foundation plan showing main foundation elements where applicable
- (c) Typical sections for roof, floor, and foundation conditions
- 3.5.8.5. Plumbing Systems
- (a) Show locations and general arrangement of plumbing fixtures and major equipment
- (b) Plan and isometric riser diagrams of all areas including hot water, cold water, waste and vent piping. Include natural gas (and meter as required), (natural gas and meter as required), (LP gas), (fuel oil) and other specialty systems as applicable.

(c) Include equipment and fixture connection schedules with descriptions, capacities, locations, connection sizes and other information as required

### 3.5.8.6. HVAC Systems

- (a) Mechanical Floor Plans: The floor plans shall show all principle architectural features of the building which will affect the mechanical design. The floor plans shall also show the following:
- (1) Room designations.
- (2) Mechanical legend and applicable notes.
- (3) Location and size of all ductwork and piping.
- (4) Location and capacity of all terminal units (i.e., registers, diffusers, grilles, hydronic baseboards).
- (5) Pre-Fabricated Paint Spray Booth (where applicable to project scope)
- (6) Paint Preparation Area (where applicable to project scope)
- (7) Exhaust fans and specialized exhaust systems.
- (8) Thermostat location.
- (9) Location of heating/cooling plant (i.e., boiler, chiller, cooling tower, etc).
- (10) Location of all air handling equipment.
- (11) Air balancing information.
- (12) Flue size and location.
- (13) Piping diagram for forced hot water system (if used).
- (b) Equipment Schedule: Provide complete equipment schedules. Include:
- (1) Capacity
- (2) Electrical characteristics
- (3) Efficiency (if applicable)
- (4) Manufacturer's name
- (5) Optional features to be provided
- (6) Physical size
- (7) Minimum maintenance clearances
- (a) Details: Provide construction details, sections, elevations, etc., only where required for clarification of methods and materials of design.
- (b) HVAC Controls: Submit complete HVAC controls equipment schedules, sequences of operation, wiring and logic diagrams, Input/Output Tables, equipment schedules, and all associated information. See the Statement of Work for additional specific requirements.

### 3.5.8.7. Fire Protection and Life Safety.

- (a) Provide plan for each floor of each building that presents a compendium of the total fire protection features being incorporated into the design. Include the following types of information:
- (1) The location and rating of any fire-resistive construction such as occupancy separations, area separations, exterior walls, shaft enclosures, corridors, stair enclosures, exit passageways, etc.
- (2) The location and coverage of any fire detection systems
- (3) The location and coverage of any fire suppression systems (sprinkler risers, standpipes, etc.)
- (4) The location of any other major fire protection equipment

- (5) Indicate any hazardous areas and their classification
- (6) Schedule describing the internal systems with the following information: fire hazard and occupancy classifications, building construction type, GPM/square foot sprinkler density, area of operation and other as required
- (b) Working plans and all other materials submitted shall meet NFPA 13 requirements, with respect to required minimum level of detail.
- 3.5.8.8. Elevators. Provide:
- (a) Description of the proposed control system
- (b) Description, approximate capacity and location of any special mechanical equipment for elevators.
- 3.5.8.9. Electrical Systems.
- (a) Electrical Floor Plan(s): Show all principle architectural features of the building which will affect the electrical design. Show the following:
- (1) Room designations.
- (2) Electrical legend and applicable notes.
- (3) Lighting fixtures, properly identified.
- (4) Switches for control of lighting.
- (5) Receptacles.
- (6) Location and designation of panelboards. Clearly indicate type of mounting required (flush or surface) and reflect accordingly in specifications.
- (7) Service entrance (conduit and main disconnect).
- (8) Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.
- (b) Building Riser Diagram(s) (from pad-mounted transformer to unit load center panelboard): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.
- (c) Load Center Panelboard Schedule(s): Indicate the following information:
- (1) Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting.
- (2) Branch Circuit Designations.
- (3) Load Designations.
- (4) Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)
- (5) Branch Circuit Connected Loads (AMPS).
- (6) Special Features
- (d) Lighting Fixture Schedule(s): Indicate the following information:
- (1) Fixture Designation.
- (2) General Fixture Description.
- (3) Number and Type of Lamp(s).

- (4) Type of Mounting.
- (5) Special Features.
- (e) Details: Provide construction details, sections, elevations, etc. only where required for clarification of methods and materials of design.
- 3.5.8.10. Electronic Systems including the following responsibilities:
- (a) Fire Detection and Alarm System. Design shall include layout drawings for all devices and a riser diagram showing the control panel, annunciator panel, all zones, radio transmitter and interfaces to other systems (HVAC, sprinkler, etc.)
- (b) Fire Suppression System Control. Specify all components of the Fire Suppression (FS) System in the FS section of the specifications. Clearly describe how the system will operate and interact with other systems such as the fire alarm system. Include a riser diagram on the drawings showing principal components and interconnections with other systems. Include FS system components on drawing legend. Designate all components shown on floor plans "FS system components" (as opposed to "Fire Alarm components"). Show location of FS control panels, HVAC control devices, sensors, and 120V power panel connections on floor plans. Indicate zoning of areas by numbers (1, 2, 3) and detectors subzoned for cross zoning by letter designations (A and B). Differentiate between ceiling mounted and under floor detectors with distinct symbols and indicate sub-zone of each.
- (c) Public Address System
- (d) Special Grounding Systems. Completely reflect all design requirements in the specifications and drawings. Specifications shall require field tests (in the construction phase), witnessed by the Government, to determine the effectiveness of the grounding system. Include drawings showing existing construction, if any.
- (e) Cathodic Protection.
- (f) Intrusion Detection, Card Access System
- (g) Central Control and Monitoring System
- (h) Mass Notification System
- (i) Electrical Power Distribution Systems
- 3.5.8.11. Separate detailed Telecommunications drawings for Information Systems including the following responsibilities:
- (a) Telecommunications Cabling
- (b) Supporting Infrastructure
- (c) Outside Plant (OSP) Cabling Campus or Site Plans Exterior Pathways and Inter-Building Backbones
- (d) Include a layout of the voice/data outlets (including voice only wall & pay phones) on telecommunication floor plan drawing, location of SIPRNET data outlets (where applicable), and a legend and symbol definition to indicate height above finished floor. Show size of conduit and cable type and size on Riser Diagram. Do not show conduit runs between backboard and outlets on the floor plans. Show underground distribution conduit and cable with sizing from point of presence to entrance facility of building.
- (e) Layout of complete building per floor Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways including Serving Zones Drawings Drop Locations and Cable ID's
- (f) Communication Equipment Rooms Plan Views Tech and AMEP/Elevations Racks and Walls. Elevations with a detailed look at all telecomm rooms. Indicate technology layout (racks, ladder-racks, etc.), mechanical/electrical layout, rack elevation and backboard elevation. They may also be an enlargement of a congested area of T1 or T2 series drawing.

## 3.6. FINAL DESIGN REVIEWS AND CONFERENCES

A final design review and review conference will be held upon completion of final design at the project installation, or – where equipment is available - by video teleconference or a combination thereof, for any design package to receive Government acceptance to allow release of the design package for construction. For smaller separate design packages, the parties may agree on alternative reviews and conferences (e.g., conference calls and electronic file sharing, etc.) through the Partnering process. Include the final design conference in the project schedule and shall indicate what part of the design work is at 100% completion. The final design conference will be held after the Government has had seven (7) calendar days after receipt of the submission to review the final design package and supporting data. For smaller packages, especially those involving only one or a few design disciplines the parties may agree on a shorter period.

### 3.7. FINAL DESIGN REQUIREMENTS

Final design deliverables for a design package shall consist of 100% complete drawings, specifications, submittal register and design analyses for Government review and acceptance. The 100% design submission shall consist of drawings, specifications, updated design analyses and any permits required by the contract for each package submitted. In order to expedite the final design review, prior to the conference, ensure that the design configuration management data and all review comment resolutions are up-to-date. Include the 100% SID and 100% FF&E binders for government approval. The Contractor shall have performed independent technical reviews (ITR's) and back-checks of previous comment resolutions, as required by Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL, including providing documentation thereof. Use DrChecks or other acceptable comment tracking system during the ITR and submit the results with each final design package

### 3.7.1. Drawings

Section: 01 33 16

- 3.7.1.1. Submit drawings complete with all contract requirements incorporated into the documents to provide a 100% design for each package submitted.
- 3.7.1.2. Prepare all drawings with the Computer-Aided Design and Drafting (CADD)/Computer-Aided Design (CAD) system, organized and easily referenced electronically, presenting complete construction information.
- 3.7.1.3. Drawings shall be complete. The Contractor is encouraged to utilize graphics, views, notes, and details which make the drawings easier to review or to construct but is also encouraged to keep such materials to those that are necessary.
- 3.7.1.4. Provide detail drawings that illustrate conformance with the contract. Include room finish schedules, corresponding color/finish/special items schedules, and exterior finish schedules that agree with the submitted SID binders.
- 3.7.1.5. The design documents shall be in compliance with the latest version of the A/E/C CAD Standard, available at <a href="https://cadbim.usace.army.mil/CAD">https://cadbim.usace.army.mil/CAD</a>. Use the approved vertical Corps of Engineers title blocks and borders on all drawings with the appropriate firm name included within the title block area.
- 3.7.1.6. CAD System and Building Information Modeling (BIM) (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order.)

All CAD files shall be fully compatible with MicroStation V8 format. Save all design CAD files as MicroStation V8 format files. All submitted BIM Models and associated Facility/Site Data shall be fully compatible with file formats.

- (a) CAD Data Final File Format: During the design development capture geo-referenced coordinates of all changes made to the existing site (facility footprint, utility line installations and alterations, roads, parking areas, etc) as a result of this contract. There is no mandatory methodology for how the geo-referenced coordinates will be captured, however, Engineering and Construction Bulletin No. 2006-15, Subject: Standardizing Computer Aided Design (CAD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects identifies the format for final as-built drawings and data sets to be delivered to the government. Close-out requirements at the as-built stage; require final geo-referenced GIS Database of the new facility along with all exterior modifications. The Government will incorporate this data set into the Installation's GIS Masterplan or Enterprise GIS System. See also, Section 01 78 02.00 10 Closeout Submittals.
- (b) Electronic Drawing Files: In addition to the native CAD design files, provide separate electronic drawing files (in editable CAD format and Adobe Acrobat PDF version 7.0 or higher) for each project drawing.
- (c) Each file (both CAD and PDF) shall represent one complete drawing from the drawing set, including the date, submittal phase, and border. Each drawing file shall be completely independent of any data in any other file, including fonts and shapes not included with the basic CAD software program utilized. Fonts that are not included as part of the default CAD software package installation or recognized as an allowable font by the A/E/C CAD Standard are not acceptable in delivered CAD files. All displayed graphic elements on all levels of the drawing files shall be part of the project drawing image. The drawing files shall not contain any graphic element that is not part of the drawing image.
- (d) Deliver BIM Model and associated Facility Data files in their native format. At a minimum, BIM files shall address major architecture design elements, major structural components, mechanical systems and electrical/communication distribution and elements as defined in Attachment F. See Attachment F for additional BIM requirements.
- (e) Drawing Index: Provide an index of drawings sheet in CAD as part of the drawing set, and an electronic list in Microsoft Excel of all drawings on the CD. Include the electronic file name, the sheet reference number, the sheet number, and the sheet title, containing the data for each drawing.
- (f) Hard Copies: Plot submitted hard copy drawings directly from the "electronic drawing files" and copy for quantities and sizes indicated in the distribution list at the end of this specification section. The Designers of Record shall stamp, sign and date original hard copy sheets as Released For Construction, and provide copies for distribution from this set.
- 3.7.2. Design Analyses
- 3.7.2.1. The designers of record shall update, finalize and present design analyses with calculations necessary to substantiate and support all design documents submitted.
- 3.7.2.2. The responsible DOR shall stamp, sign and date the design analysis. Identify the software used where, applicable (name, version, vendor). Generally, provide design analyses, individually, in an original (file copy) and one copy for the assigned government reviewer.
- 3.7.2.3. All disciplines review the LEED design analysis in conjunction with their discipline-specific design analysis; include a copy of the separable LEED design analysis in all design analysis submittals.
- 3.7.2.4. Do not combine multi-disciplined volumes of design-analysis, unless multiple copies are provided to facilitate multiple reviewers (one copy per each separate design analysis included in a volume).
- 3.7.3. Specifications

Specifications shall be 100% complete and in final form.

3.7.4. Submittal Register

Prepare and update the Submittal Register and submit it with the 100% design specifications (see Specification Section 01 33 00, SUBMITTAL PROCEDURES) with each design package. Include the required submittals for each specification section in a design package in the submittal register.

### 3.7.5. Preparation of DD Form 1354 (Transfer of Real Property)

This form itemizes the types, quantities and costs of various equipment and systems that comprise the project, for the purpose of transferring the new construction project from the Corps Construction Division to the Installation's inventory of real property. The Government will furnish the DB Contractor's design manager a DD Form 1354 checklist to use to produce a draft Form 1354. Submit the completed checklist and prepared draft Form DD 1354 with the 100% design in the Design Analysis. The Corps will use these documents to complete the final DD 1354 upon completion of construction.

### 3.7.6. Acceptance and Release for Construction

3.7.6.1. At the conclusion of the Final Design Review (after resolutions to the comments have been agreed upon between DOR and Government reviewers), the Contracting Officer or the ACO will accept the Final Design Submission for the design package in writing and allow construction to start for that design package. The Government may withhold acceptance until all major corrections have been made or if the final design submission requires so many corrections, even though minor, that it isn't considered acceptably complete.

3.7.6.2. Government review and acceptance of design submittals is for contract conformance only and shall not relieve the Contractor from responsibility to fully adhere to the requirements of the contract, including the Contractor's accepted contract proposal, or limit the Contractor's responsibility of design as prescribed under Special Contract Requirement: "Responsibility of the Contractor for Design" or limit the Government's rights under the terms of the contract. The Government reserves the right to rescind inadvertent acceptance of design submittals containing contract deviations not separately and expressly identified in the submittal for Government consideration and approval.

### 3.8. DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS

After the Final Design Submission and Review Conference and after Government acceptance of the Final Design submission, revise the design documents for the design package to incorporate the comments generated and resolved in the final review conference, perform and document a back-check review and submit the final, design complete documents. Label the final design complete documents "FOR CONSTRUCTION" or use similar language. In addition to the final drawings and specifications, the following deliverables are required for distribution and field use. The deliverable includes all documentation and supporting design analysis in final form, as well as the final review comments, disposition and the back-check. As part of the quality assurance process, the Government may perform a back-check of the released for construction documentation. Promptly correct any errors or omissions found during the Government back-check. The Government may withhold retainage from progress payments for work or materials associated with a final design package until this submittal has been received and the Government determines that it is complete.

### 3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

### 3.9.1. Submittal Distribution and Quantities

General: The documents which the Contractor shall submit to the Government for each submittal are listed and generally described in preceding paragraphs in this Section. Provide copies of each design submittal and design substantiation as follows (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order):

Activity and Address	Drawing Size (Full Size) Half Size Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size)  NA  Full Sets/ *Partial Sets	Non-BIM Data  CD-ROM or DVD as Necessary  (PDF& .dgn)	Furniture Submittal (Per Attachment B)	Structural Interior Design Submittal	BIM Data DVD (Per Attach F)
Commander, U.S.Army Engineer District [Not Supplied - DistrictInfoGene ral: CONSTRUCTIO N_DISTRICT]	6/0	6/0	0/0	3	1	1	0
Commander, U.S.Army Engineer District, Center of Standardization Huntsville Center	0/0	0/0	0/0	2	1	1	0
Installation	5/0	5/0	0/0	2	2	2	0
U.S.Army Corps of Engineers Construction Area Office	3/0	3/0	0/0	2	1	1	0
Information Systems Engineering Command (ISEC)	0/0	0/0	0/0	1	*Partial Set (Work Station/System Furniture- IT Details)	N/A	1
Huntsville Engineer & Support Center, Central Furnishings Program	N/A	N/A	N/A	N/A	1 Interim/Refer to attachment B for the final submission Qty	N/A	N/A
Other Offices	3/0	3/0	0/0	3	N/A	0	0

\*NOTE: For partial sets of drawings, specifications and design analyses, see paragraph 3.9.3.3, below.

\*\*NOTE: When specified below in 3.9.2, furnish Installation copies of Drawings as paper copies, in lieu of the option to provide secure web-based submittals.

### 3.9.2. Web based Design Submittals

Except for full or half-sized drawings for Installation personnel, as designated in the Table above, Web based design submittals will be acceptable as an alternative to the paper copies listed in the Table above, provided a single hard-copy PDF based record set is provided to the Contracting Officer for record purposes. Where the contract requires the Contractor to submit documents to permitting authorities, still provide those authorities paper copies (or in an alternate format where required by the authority). Web based design submittal information shall be provided with adequate security and availability to allow unlimited access those specifically authorized to Government reviewers while preventing unauthorized access or modification. File sizes must be of manageable size for reviewers to quickly download or open on their computers. As a minimum, drawings shall be full scale on American National Standards Institute (ANSI) D sheets (34" x 22"). In addition to the optional website, provide the BIM data submission on DVD to each activity and address noted above in paragraph 3.9.1 for each BIM submission required in Attachment F.

### 3.9.3. Mailing of Design Submittals

- 3.9.3.1. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract (or individual task order if this is an indefinite delivery/indefinite quantity, task order contract). Mail the submittals to seven (7) different addresses. Assemble drawing sheets, specs, design analyses, etc. into individual sets; do not combine duplicate pages from individual sets so that the government has to assemble a set.
- 3.9.3.2. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.
- 3.9.3.3. Provide partial sets of drawings, specifications, design analyses, etc., as designated in the Table in paragraph 3.9.1, to those reviewers who only need to review their applicable portions of the design, such as the various utilities. The details of which office receives what portion of the design documentation will be worked out after award.

### 3.10. AS-BUILT DOCUMENTS

Provide as-built drawings and specifications in accordance with Section 01 78 02.00 10, CLOSEOUT SUBMITTALS. Update LEED design phase documentation during construction as needed to reflect construction changes and advancing project completion status (example - Commissioning Plan updates during construction phase) and include updated LEED documentation in construction closeout submittal.

# ATTACHMENT A STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS

### 1.0 GENERAL INFORMATION

Structural Interior Design includes all building related elements and components generally part of the building itself, such as wall finishes, ceilings finishes, floor coverings, marker/bulletin boards, blinds, signage and built in casework. Develop the SID in conjunction with the furniture footprint.

## 2.0 STRUCURAL INTERIOR DESIGN (SID) REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

### 2.1. FORMAT AND SCHEDULE

Prepare and submit for approval an interior and exterior building finishes scheme for an interim design submittal. The DOR shall meet with and discuss the finish schemes with the appropriate Government officials prior to preparation of the schemes to be presented. Present original sets of the schemes to reviewers at an interim design conference.

At the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers, the Contractor may proceed to final design with the interior finishes scheme presented.

The SID information and samples are to be submitted in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover. When there are numerous pages with thick samples, use more than one binder. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Structural Interior Design" package. Include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Design submittal requirements include, but are not limited to:

### 2.1.1. Narrative of the Structural Interior Design Objectives

The SID shall include a narrative that discusses the building related finishes. Include topics that relate to base standards, life safety, sustainable design issues, aesthetics, durability and maintainability, discuss the development and features as they relate to the occupants requirements and the building design.

### 2.1.2. Interior Color Boards

Identify and key each item item on the color boards to the contract documents to provide a clear indication of how and where each item will be used. Arrange finish samples to the maximum extent possible by room type in order to illustrate room color coordination. Label all samples on the color boards with the manufacturer's name, patterns and colors name and number. Key or code samples to match key code system used on contract drawings.

Material and finish samples shall indicate true pattern, color and texture. Provide photographs or colored photocopies of materials or fabrics to show large overall patterns in conjunction with actual samples to show the actual colors. Finish samples must be large enough to show a complete pattern or design where practical.

Color boards shall include but not be limited to original color samples of the following:

All walls finishes and ceiling finishes, including corner guards, acrylic wainscoting and wall guards/chair rail finishes

All tile information, including tile grout color and tile patterns.

- All flooring finishes, including patterns.
- All door, door frame finishes and door hardware finishes
- All signage, wall base, toilet partitions, locker finishes and operable/folding partitions and trim
- All millwork materials and finishes (cabinets, counter tops, etc.)
- All window frame finishes and window treatments (sills, blinds, etc.)

Color board samples shall reflect all actual finish textures, patterns and colors required as specified. Patterned samples shall be of sufficient size to adequately show pattern and its repeat if a repeat occurs.

### 2.1.3. Exterior Color Boards

Prepare exterior finishes color boards in similar format as the interior finishes color boards, for presentation to the reviewers during an interim design conference. Provide original color samples of all exterior finishes including but not limited to the following:

- All Roof Finishes
- All Brick and Cast Stone Samples
- All Exterior Insulation and Finish Samples
- All Glass Color Samples
- All Exterior Metals Finishes
- All Window & Door Frame Finishes
- All Specialty Item Finishes, including trim

Identify each item on the exterior finishes color boards and key to the building elevations to provide a clear indication of how and where each item will be used.

### 2.2. STRUCTURAL INTERIOR DESIGN DOCUMENTS

### 2.2.1. General

Structural interior design related drawings must indicate the placement of extents of SID material, finishes and colors and must be sufficiently detailed to define all interior work. The following is a list of minimum requirements:

### 2.2.2. Finish Color Schedule

Provide finish color schedule(s) in the contract documents. Provide a finish code, material type, manufacturer, series, and color designations. Key the finish code to the color board samples and drawings.

### 2.2.3. Interior Finish Plans

Indicate wall and floor patterns and color placement, material transitions and extents of interior finishes.

### 2.2.4. Furniture Footprint Plans

Provide furniture footprint plans showing the outline of all freestanding and systems furniture for coordination of all other disciplines.

### 2.2.5. Interior Signage

Include interior signage plans or schedules showing location and quantities of all interior signage. Key each interior sign to a quantitative list indicating size, quantity of each type and signage text.

2.2.6. Interior Elevations, Sections and Details

Indicate material, color and finish placement.

# ATTACHMENT B FURNITURE. FIXTURES & EQUIPMENT (FF&E) REQUIREMENTS

### 1.0 FF&E REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

### 1.1. FORMAT AND SCHEDULE

Section: 01 33 16

Prepare and submit for approval a comprehensive FF&E scheme for an interim design submittal. The Contractor's interior designer, NOT A FURNITURE DEALER, shall develop the design. FF&E is the selection, layout, specification and documentation of furniture and includes but is not limited to workstations, seating, tables, storage and shelving, filing, trash receptacles, clocks, framed artwork, artificial plants, and other accessories. Contract documentation is required to facilitate pricing. procurement and installation. The FF&E package is based on the furniture footprint developed in the Structural Interior Design (SID) portion of the interior design. Develop the FF&E package concurrently with the building design to ensure that there is coordination between the electrical outlets, switches, Jboxes, communication outlets and connections, and lighting as appropriate. In addition, coordinate layout with other building features such as architectural elements, thermostats, location of TV's, GF/GI equipment (for example computers, printers, copiers, shredders, faxes), etc. Locate furniture in front of windows only if the top of the item falls below the window and unless otherwise noted, do not attach furniture including furniture systems to the building. If project has SIPRNET and/or NIPRNET, coordinate furniture layout with SIPRNET and NIPRNET separation requirements. Verify that access required by DOIM for SIPRNET box and conduit is provided. The DOR shall interview appropriate Government personnel to determine FF&E requirements for furniture and furnishings prior to preparation of the scheme to be presented. Determine FFE items and quantities by, but not limited to: (1) the number of personnel to occupy the building, (2) job functions and related furniture/office equipment to support the iob function. (3) room functions. (4) rank and grade. Present original sets of the scheme to reviewers at an interim design conference upon completion of the interim architectural submittal or three months prior to the submittal of the final FF&E package (whichever comes first).

Design may proceed to final with the FF&E scheme presented at the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers.

Provide sevencopies of the electronic versions of all documents upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first), to ensure adequate time for furniture acquisition. Provide six compact disks with all drawings files needed to view the complete drawings unbound and in the latest version AutoCAD. Provide six additional compact disks of all text documents in Microsoft Word or Excel..

Submit five copies of the final and complete FF&E information and samples in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first). Use more than one binder when there are numerous pages with thick samples. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out for upholstery and finish boards. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Furniture, Fixtures & Equipment" package and include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Design submittal requirements include, but are not limited to:

### 1.1.1. Narrative of Interior Design Objectives

Provide a narrative description of the furniture, to include functional, safety and ergonomic considerations, durability, sustainability, aesthetics, and compatibility with the building design.

### 1.1.2. Furniture Order Form

Prepare one Furnishings Order Form for each item specified in the design. This form identifies all information required to order each individual item. In addition to the project name and location, project number, and submittal phase, the order form must include:

- (a) Furniture item illustration and code
- (b) Furniture item name
- (c) Job name, location, and date
- (d) General Services Administration (GSA) FSC Group, part, and section
- (e) GSA Contract Number, Special Item Number (SIN), and contract expiration date
- (f) Manufacturer, Product name and Product model number or National Stock Number (NSN)
- (g) Finish name and number (code to finish samples)
- (h) Fabric name and number, minimum Wyzenbeek Abrasion Test double rubs (code to fabric samples)
- (i) Dimensions
- (j) Item location by room number and room name
- (k) Quantity per room
- (I) Total quantity
- (m) Special instructions for procurement ordering and/or installation (if applicable)
- (n) Written Product Description: include a non-proprietary paragraph listing the salient features of the item to include but not limited to:
- (1) required features and characteristics
- (2) ergonomic requirements
- (3) functional requirements
- (4) testing requirements
- (5) furniture style
- (6) construction materials
- (7) minimum warranty

The following is an example for "m" features and characteristics, ergonomic requirements and functional requirements:

### Chair Description:

- (1) Mid-Back Ergonomic Task Chair
- (2) Pneumatic Gaslift; Five Star Base
- (3) Mesh Back; Upholstered Seat
- (4) Height and Width Adjustable Task Arms:
- a. Arm Height: 6"- 11" (+-1/2")
- b. Arm Width: 2"-4" adjustment
- (5) Height Adjustable Lumbar Support

- (6) Adjustable Seat Height 16"-21" (+- 1")
- (7) Sliding Seat Depth Adjustment 15"-18" (+-1")
- (8) Standard Hard Casters (for carpeted areas)
- (9) Overall Measurements:
- a. Overall width: 25" 27"
- b. Overall depth: 25"-28"
- (10) Must have a minimum of the following adjustments (In addition to the above):
- a. 360 Degree Swivel
- b. Knee-Tilt with Tilt Tension
- c. Back angle
- d. Forward Tilt
- e. Forward Tilt and Upright Tilt Lock

For projects with systems furniture, also provide a written description of the following minimum requirements:

- (1) Type furniture systems (panel, stacking panels, spine wall, desk based system, or a combination)
- (2) Minimum noise reduction coefficient (NRC)
- (3) Minimum sound transfer coefficient (STC)
- (4) Minimum flame spread and smoke development
- (5) UL testing for task lighting and electrical system
- (6) Panel widths and heights and their locations (this may be done on the drawings)Worksurface types and sizes (this may be done on the drawings)
- (7) Worksurface edge type
- (8) Varying panel/cover finish materials and locations (locations may be shown on the drawings)
- (9) Storage requirements
- (10) Keyboard requirements
- (11) Lock and keying requirements
- (12) Accessory components (examples: tack boards, marker boards, paper management)
- (13) Electrical and communication raceway requirement; type, capacity and location (base, beltline, below and/or above beltline)
- (14) Locations of communication cables (base, beltline, below and/or above beltline, top channel)
- (15) Types of electrical outlets
- (16) Types of communication jacks; provided and installed by others
- (17) Locations of electrical outlets and communication jacks (this may be done on the drawings)
- (18) Type of cable (examples: Cat. 5, Cat. 6, fiber optic; UTP or STP, etc.) system needs to support; provided and installed by others

### 1.1.3. Manufacturer & Alternate Manufacturer List

Provide a table consisting of all the major furniture items in the order forms and two alternate manufacturers for each item. ALTERNATE MANUFACTURER ITEMS MUST BE SELECTED FROM

GSA SCHEDULE AND MEET ALL THE SALIENT FEATURES OF THE ORIGINALLY SPECIFIED ITEM. Provide manufacturer name, address, telephone number, product series and product name for each item and the two alternate items. Major furniture items include, but are not limited to, casegoods, furniture systems, seating, and tables. Organize matrix by item code and item name.

### 1.1.4. FF&E Procurement List

Provide a table that lists all FF&E furniture, mission unique equipment and building Contractor Furnished/Contractor Installed (CF/CI) items. Give each item a code and name and designate whether item will be procured as part of the FF&E furniture, mission unique equipment or the building construction contract. Use the item code to key all FF&E documents including location plans, color boards, data sheets, cost estimate, etc. Divide the FF&E package into different sections based on this listing, applies to order forms and cost estimates.

### 1.1.5. Points of Contact (POCs)

Provide a comprehensive list of POCs needed to implement the FF&E package. This would include but not be limited to appropriate project team members, using activity contacts, interior design representatives, construction contractors and installers involved in the project. In addition to name, address, phone, fax and email, include each contact's job function. Divide the FF&E package into different sections based on this listing, applies to order forms and cost estimates.

### 1.1.6. Color Boards

Provide color boards for all finishes and fabrics for all FF&E items. Finishes to be included but not limited to paint, laminate, wood finish, fabric, etc.

### 1.1.7. Itemized Furniture Cost Estimate

Provide an itemized cost estimate of furnishings keyed to the plans and specifications of products included in the package. This cost estimate should be based on GSA price schedules. The cost estimate must include separate line items for general contingency, installation, electrical hook-up for systems furniture or other furniture requiring hardwiring by a licensed electrician, freight charges and any other related costs. Installation and freight quotes from vendors should be used in lieu of a percentage allowance when available. Include a written statement that the pricing is based on GSA schedules. An estimate developed by a furniture dealership may be provided as support information for the estimate, but must be separate from the contractor provided estimate.

### 1.2. INTERIOR DESIGN DOCUMENTS

### 1.2.1. Overall Furniture and Area Plans

Provide floor Plans showing locations and quantities of all freestanding, and workstation furniture proposed for each floor of the building. Key each room to a large scale Furniture Placement Plan showing the furniture configuration, of all furniture. Provide enlarged area plans with a key plan identifying the area in which the building is located. Key all the items on the drawings by furniture item code. Do not provide manufacturer specific information such as product names and numbers on drawings, Drawings shall be non-proprietary. This is typical for FFE on all plans, including those mentioned below. Coordinate the overall furniture and area plans with the Life Safety Code Review to ensure adequate clearances are provided for egress. Provide a narrative of this coordination to accompany the Furniture and Area plans.

### 1.2.2. Workstation Plans

Show each typical workstation configuration in plan view. In addition, provide either elevations or an isometric view. Drawings shall illustrate panels and all major components for each typical workstation configuration. Identify workstations using the same numbering system as shown on the project drawings. Key components to a legend on each sheet which identifies and describes the components along with dimensions. Provide the plan, elevations and isometric of each typical workstation together on the same drawing sheet.

### 1.2.3. Panel Plans

Show panel locations and critical dimensions from finished face of walls, columns, panels including clearances and aisle widths. Key panel assemblies to a legend which shall include width, height, configuration of frames, panel fabric and finishes (if there are different selections existing within a project), powered or non-powered panel and wall mount locations.

### 1.2.4. Desk Plans

Provide typical free standing desk configurations in plan view. In addition, provide either elevation or an isometric view and identify components to clearly represent each desk configuration.

### 1.2.5. Reflected Ceiling Plans

Provide typical plans showing ceiling finishes and heights, lighting fixtures, heating ventilation and air conditioning supply and return, and sprinkler head placement for coordination of furniture.

### 1.2.6. Electrical and Telecommunication Plans

Show power provisions including type and locations of feeder components, activated outlets and other electrical componentsShow locations and quantities of outlets for workstations. Clearly identify different outlets, i.e. electrical, LAN and telecommunication receptacles indicating each type proposed. Show wiring configuration, (circuiting, switching, internal and external connections) and provide as applicable.

### 1.2.7. Artwork Placement Plans

Provide an Artwork Placement Plan to show location of artwork, assign an artwork item code to each piece of artwork. As an alternative, artwork can be located on the Furniture Plans. Provide a schedule that identifies each piece by room name and number. Provide installation instructions; include mounting height.

### 1.2.8. Window Drapery Plans

Provide Interior Window Drapery Plans. Key each drapery treatment to a schedule showing color, pattern, material, drapery size and type, draw direction, location and quantities.

### 1.2.9. Portable Fire extinguishers:

Provide a list of all required portable fire extinguishers, with descriptions (location, size, type, etc.) and total number per type. See also attachment D, "SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW", paragraph 1.14.

### 1.3. FURNITURE SELECTION

1.3.1. Select furniture from the GSA Schedules. Specify furniture available open market when an item is not available on the GSA Schedules. Provide justification fort items not available on the GSA Schedules.

1.3.2. To the greatest extent possible when specifying furniture work within a manufacturer's family of furniture for selections, example: Steelcase, Turnstone, Brayton International, Metro, and Vecta are all Steelcase companies. Each alternate should also be specified from a manufacturer's family of furniture, example: first set of alternates would be specified from Knoll's family of furniture and the second from Herman Miller family of furniture. It may be necessary to make some selections from other than a manufacturer's family of furniture if costs are not reasonable for particular items, some items are not available or appropriate for the facility or the items are not on GSA Schedule. If this occurs, consider specifying product from an open line that is accessible by numerous dealerships. Select office furniture including case goods, tables, storage, seating, etc. that is compatible in style, finish and color. Select furniture that complies with ANSI/BIFMA and from manufacturer's standard product line as shown in the most recent published price list and/or amendment and not custom product.

### 1.4. CONSTRUCTION

- 1.4.1. Provide knee space at workstations and tables that is not obstructed by panels/legs that interfere with knee space of seated person and specificy modesty panels at walls to be of a height or be hinged to allow access to building wall electrical outlets and communication jacks. Provide desks, storage and tables with leveling devices to compensate for uneven floors.
- 1.4.2. Unless otherwise noted, specify workstations and storage of steel construction. Provide high pressure laminate worksurface tops constructed to prevent warpage (thermallyfused worksurfaces are not acceptable). Provide user friendly features such as radius edges. Do not use sharp edges and exposed connections and ensure the underside of desks, tables and worksurfaces are completely and smoothly finished. Provide abutting worksurfaces that mate closely and are of equal heights when used in side-by-side configurations in order to provide a continuous and level worksurface.
- 1.4.3. Drawers shall stay securely closed when in the closed position and protect wires from damage during drawer operation. Include a safety catch to prevent accidental removal when fully open
- 1.4.4. Unless otherwise noted, provide lockable desks and workstations, filing cabinets and storage. Key all locks within a one person office the same; key all one person offices within a building differently. If an office or open office area has more than one workstation, key all the workstations differently, but key all locks within an individual workstation the same. Use tempered glass glazing when glazing is required. Use light-emitting diode (LED)/solid state lighting where task lighting is required in furniture.

### 1.5. FINISHES AND UPHOLSTERY

- 1.5.1. Specify neutral colors for casegoods, furniture systems, storage and tables. Specify desk worksurfaces and table tops that are not too light or too dark in color and have a pattern to help hide soiling. Accent colors are allowed in break and lounge areas. Keep placement of furniture systems panel fabric accent colors to a minimum. All finishes shall be cleanable with ordinary household cleaning solutions.
- 1.5.2. Use manufacturer's standard fabrics; including textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Customers Own Material (COM) can be used in headquarter buildings in command suites with executive furniture. Coordinate specific locations with Corps of Engineers Interior Designer.
- 1.5.3. Specify seating upholstery that meets Wyzenbeek Abrasion Test, 55,000 minimum rubs. Specify a soil retardant finish for woven fabrics if Crypton or vinyl upholstery is not provided for seating in dining areas. Use manufacturer's standard fabrics. This includes textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Specify upholstery and finish colors and patterns that help hide soiling. Specify finishes that can be cleaned with ordinary household cleaning solutions.

### 1.6. ACCESSORIES

- 1.6.1. Specify all accessories required for completely finished furniture installation. Provide filing cabinets and storage for office supplies. Provide tack surfaces at workstations with overhead storage. Provide tackable surfaces at workstations with overhead storage.
- 1.6.2. Not Used.
- 1.6.3. Workstations are to be equipped with stable keyboard trays that have height adjustability, tilting capability, including negative tilt, have a mouse pad at same height as the keyboard tray that can accommodate both left and right handed users, and retractable under worksurface.

### 1.7. MISSION UNIQUE EQUIPMENT

Funding for FF&E furniture items and mission unique equipment (MUE) items are from two different sources. Separate the designs and procurement documentation for FFE items and MUE. MUE includes, but is not limited to, items such as commerical appliances, fitness equipment, IT equipment and supporting carts. The User will purchase and install mission unique equipment items, unless otherwise noted. Identify locations of known MUE items such as commercial appliances, etc. for space planning purposes.

### 1.8. SUSTAINABILITY

- 1.8.1. For all designs provided regardless of facility type, make every effort to implement all aspects of sustainability to the greatest extent possible for all the selections made in the FF&E package. This includes but is not limited to the selection of products that consider: **Material Chemistry and Safety of Inputs** (What chemicals are used in the construction of the selections?); **Recyclability** (Do the selections contain recycled content?); **Disassembly** (Can the selections be disassembled at the end of their useful life to recycle their materials?).
- 1.8.2. Make selections to the greatest extent possible of products that possess current McDonough Braungart Design Chemistry (MBDC) certification or other "third-party" certified Cradle to Cradle program, Forest Stewardship Council (FSC) certification, GREENGAURD certification or similar "third-party" certified products consisting of low-emitting materials.

### 1.9. FURNITURE SYSTEMS

### 1.9.1. General.

Where appropriate, design furniture systems in open office areas. Coordinate style and color of furniture systems with other storage, seating, etc. in open office areas. Minimize the number of workstation typicals and the parts and pieces required for the design to assist in future reconfiguration and inventorying.

### 1.9.2. Connector Systems.

Specify a connector system that allows removal of a single panel or spine wall within a typical workstation configuration without requiring disassembly of the workstation or removal of adjacent panels. Specify connector system with tight connections and continuous visual seals. When Acoustical panels are used, provide connector system with continuous acoustical seals. Specify concealed clips, screws, and other construction elements, where possible.

### 1.9.3. Panels and Spine Walls

Specify panels and spine walls with hinged or removable covers that permit easy access to the raceway when required but are securely mounted and cannot be accidentally dislodged under normal conditions. Panels shall be capable of structurally supporting more than 1 fully loaded component per panel per side. Raceways are to be an integral part of the panel and must be able to support lay-in cabling and have a large capacity for electrical and IT. Do not thread cables through the frame.

### 1.9.4. Electrical And Information/Technology (IT)

Design furniture with electrical systems that meets requirements of UL 1286 when powered panels are required and UL approved task lights that meet requirements of NFPA 70. Dependent on user requirements and Section 01 10 00, paragraph 3 requirements, it is recommended that workstation electrical and IT wiring entry come from the building walls to eliminate the use of power poles and access at the floor. Design electrical and IT systems that are easily accessed in the spine wall and panels without having to move return panels and components. Electrical and IT management will be easily accessible by removable wall covers which can be removed while workstation components are still attached. Specify connector system that has continuation of electrical and IT wiring within workstations and workstation to workstation.

### 1.9.5. Pedestals

Specify pedestals that are interchangeable from left to right, and right to left, and retain pedestal locking system capability.

### 1.10. EXECUTIVE FURNITURE

- 1.10.1. Design for executive furniture in command areas, coordinate specific locations with Corps of Engineers Interior Designer. Use upgraded furniture, upholsteries and finishes in command suites. This includes but is not limited to wood casegoods, seating and tables. Select executive furniture casegoods from a single manufacturer and style line, to include workstations, credenzas, filing, and storage, etc.
- 1.10.2. Specify furniture with wood veneer finish with mitered solid wood edge of same wood type. Other executive office furniture such as seating, tables, executive conference room furniture, etc. shall be compatible in style, finish and color with executive furniture casegoods.

### 1.11. SEATING

### 1.11.1. General

Specify appropriate chair casters and glides for the floor finish where the seating is located. All task seating shall support up to a minimum of 250 lbs.

### 1.11.2. Desk and Guest Seating

Select ergonomic desk chairs with casters, waterfall front, swivel, tilt, variable back lock, adjustable back height or adjustable lumbar support, pneumatic seat height adjustment, and padded, contoured upholstered seat and back. Desk and guest chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Depending on scale of desk chair provide seat pan forward and back adjustment to increase or decrease depth of seat pan. All desk chairs shall have an adjustable seat height range of 4 1/2", range to include 16 1/2-20". Select guest chairs that are compatible in style, finish and color with the desk chairs.

### 1.11.3. Conference Room Seating

At tables, select ergonomic conference seating with casters, non-upholstered arms, waterfall front, swivel, tilt, pneumatic seat height adjustment, and padded, contoured seat and back, unless otherwise noted.

Select arm height and/or design that allows seating to be moved up closely to the table top. Conference chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Perimeter conference chairs shall be compatible in style, finish and color with conference seating at the tables.

### 1.11.4. Lounge, Waiting and Reception Area Seating

Select seating with arms and cushioned, upholstered seat and back. In heavy use areas, arms shall be easily cleaned such as non-upholstered arms or upholstered arms with wood arm caps unless otherwise noted.

### 1.11.5. Break Room Seating

Select stackable seating that is easily cleaned. Seating shall be appropriate for table and counter heights as applicable with non-upholstered arms if arms are required. Chairs shall have metal legs and composite materials for seats.

### 1.12. FILING AND STORAGE.

Select storage and shelving units that meet customer's functional load requirements for stored items. Specify counterweights for filing cabinets when required by the manufacturer for stability. File drawers shall allow only one drawer to be opened at a time. Provide heavy duty storage and shelving if information is not available.

### 1.13. TRAINING TABLES.

raining tables shall be reconfigurable, moveable and storable; lighter weight folding with dollies or castered as necessary. Plastic laminate self edges are unacceptable. Specify power and data requirements and dollies as required.

### 1.14. FURNITURE WARRANTIES.

Specify manufacturer's performance guarantees or warranties that include parts, labor and transportation as follows:

Furniture System, unless otherwise noted – 10 year minimum Furniture System Task Lights – 2 year minimum, excluding bulbs Furniture System Fabric – 3 year minimum Wood Desks - 10 year minimum

Metal Desks – 12 year minimum Seating, unless otherwise noted - 10 year minimum Seating Mechanisms and Pneumatic Cylinders - 10 years Seating Fabric - 3 years minimum Wood Filing and Storage - 10 year minimum

Tables, unless otherwise noted - 10 year minimum
Table Mechanisms – 5 year minimum
Table Ganging Device - 1 year minimum
Items not listed above - 1 year minimum

# ATTACHMENT C TRACKING COMMENTS IN DRCHECKS

### 1.0 General

The Government and DB Contractor shall set up the project in Dr Checks. Throughout the design process, the parties shall enter, track, and back-check comments using the DrChecks system. Government and Contractor reviewers enter design review comments into DrChecks. Designers of Record shall annotate comments timely and specifically to indicate for the review conference exactly what action will be taken or why the action is not required. After the design review conference and prior to the next design submittal for the package, the DOR's will annotate those comments that require DOR action, design revision, etc. to show how and where it has been addressed in the design documents, This shall be part of the required design configuration management plan. Comments considered critical by the conference participants shall be flagged as such.

### 2.0 DrChecks Review Comments

The Contractor and the Government shall monitor DrChecks to assure all comments are annotated and resolved prior to the next submittal. Print and include the DrChecks comments and responses and included in the design analysis for record in the next design submittal for that package.

- 2.1. Upon review of comments prior to the design review conference, the DOR(s) shall identify whether they concur, non-concur, mark it "for information only" or mark it "check and resolve". Indicate exactly what action will be taken or why the action is not required.
- 2.2. Conference participants (reviewers) will expect coordination between Design Analysis calculations and the submitted design. Reviewers will also focus on the design submittal's satisfaction of the contract requirements.
- 2.3. After the conference, the DOR(s) shall formally respond to each applicable comment in DrChecks a second time prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Designers of Record are encouraged to directly contact reviewers to discuss and agree to the formal comment responses rather than relying only on DrChecks and review meetings to discuss comments. With the next submittal, reviewers will back-check answers to the comments against the new submittal, in addition to reviewing additional design work.
- 2.4. Clearly annotate in DrChecks those comments that, in the DB Contractor's opinion, require effort outside the scope of the contract. Do not proceed with work outside the contract until a modification to the contract is properly executed, if one is necessary.

### 3.0 DrChecks Initial Account Set-Up

To initialize an office's use of DrChecks, choose a contact person within the office to call the DrChecks Help Desk at 800-428-HELP, M-F, 8AM-5PM, Central time. This POC will be given an office password to distribute to others in the office. Individuals can then go to the hyperlink at <a href="http://www.projnet.org">http://www.projnet.org</a> and register as a first time user. Upon registration, each user will be given a personal password to the DrChecks system.

3.1. Once the office and individuals are registered, the COE's project manager or lead reviewer will assign the individuals and/or offices to the specific project for review. At this point, persons assigned can make comments, annotate comments, and close comments, depending on their particular assignment.

### 4.0 DrChecks Reviewer Role

The Contractor is the technical reviewer and the Government is the compliance reviewer of the DB's design documents. Each reviewer enters their own comments into the Dr Checks system. To enter comments:

- 4.1. Log into DrChecks.
- 4.2. Click on the appropriate project.
- 4.3. Click on the appropriate review conference. An Add comment screen will appear.
- 4.4. Select or fill out the appropriate sections (particularly comment discipline and type of document for sorting) of the comment form and enter the comment in the space provided.
- 4.5. Click the Add Comment button. The comment will be added to the database and a fresh screen will appear for the next comment you have.
- 4.6. Once comments are all entered, exit DrChecks by choosing "My Account" and then Logout.

### 5.0 DrChecks Comment Evaluation (Step 1 of 2)

The role of the DOR(s) is to evaluate and respond to the comments entered by the Government's and DB Contractor's reviewers. To respond to comments:

- 5.1. Log into DrChecks.
- 5.2. Click on the appropriate project.
- 5.3. Under "Evaluate" click on the number under "Pending".
- 5.4. Locate the comments that require your evaluation. (Note: If you know the comment number you can use the Quick Pick window on your home page in DrChecks; enter the number and click on go.)
- 5.5. Select the appropriate evaluation radio button (concur, non-concur, for information only, or check and resolve) and respond with a brief explanation in the Discussion field. An explanation other than to say "concur" is not necessary for "Concur", but may be useful for the Design Configuration Management purposes.
- 5.6. Click on the Add button. The evaluation will be added to the database and a fresh screen will appear with the next comment.
- 5.7. Once evaluations are all entered, exit DrChecks by choosing "My Account" and then Logout.

### 6.0 DrChecks Comment Evaluation (Step 2 of 2)

This is where the DOR(s) respond to each applicable comment in DrChecks after the design review conference, prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Respond to the previous comments, following the same steps as above, adding the narrative in the discussion field.

### 7.0 DrChecks Back-Check

At the following design conference, (where applicable) or at some other agreed time, Government and Contractor reviewers will back-check comment annotations against newly presented documents to verify that the designers' responses are acceptable and that all revisions have been completed. Reviewers

shall either enter additional back-check comments, if necessary, or close those where actions are complete.

- 7.1. Log into DrChecks.
- 7.2. Click on the appropriate project.
- 7.3. Under "My Backcheck" click on the number under "Pending".
- 7.4. If you agree with the designer's response select "Close Comment" and add a closing response if desired.
- 7.5. If you do not agree with the designer's response or the submittal does not reflect the response given, select "Issue Open", enter additional information.
- 7.6. Click on the Add button. The back-check will be added to the database and a fresh screen will appear with the next comment.
- 7.7. Once back-checks are all entered, exit DrChecks by choosing "My Account" and then Logout. The design is completed and final when there are no pending comments to be evaluated and there are no pending or open comments under back-check.

## ATTACHMENT D SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW

Instructions: Use the information outlined in this document to provide the minimum requirement for development of Fire Protection and Life Safety Code submittals for all building projects. Additional and supplemental information may be used to further develop the code review. Insert N/A after criteria, which may be "not applicable".

1.0	SAMPLE FIRE PROTECTION	AND LIFE SAFETY CODE REVIEW
1.0	SAMELL LINE FIXULEGION	I AND LILE SALLII CODE KEVILV

- 1.1. Project Name (insert name and location)
- 1.2. Applicable Codes and Standards
- 1.2.1. Unified Facilities Criteria (UFC): 3-600-01, Design: Fire Protection Engineering For Facilities
- 1.2.2. International Building Code (IBC) for fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements, except as modified by UFC 3-600-01.
- 1.2.3. National Fire Protection Association (NFPA) 101 Life Safety Code (latest edition), for building egress and life safety and applicable criteria in UFC 3-600-01.
- 1.2.4. ADA and ABA Accessibility Guidelines. For Buildings and Facilities See Section 01 10 00, Paragraph 3 for facility specific criteria.
- 1.3. Occupancy Classification IBC chapters 3 and 4
- 1.4. Construction Type IBC chapter 6
- 1.5. Area Limitations IBC chapter 5, table 503
- 1.6. Allowable Floor Areas IBC section 503, 505
- 1.7. Allowable area increases IBC section 506, 507
- 1.8. Maximum Height of Buildings

IBC section 504

- 1.9. Fire-resistive substitution
- 1.10. Occupancy Separations IBC table 302.3.2
- 1.11. Fire Resistive Requirements
- 1.11.1. Exterior Walls [ ] hour rating, IBC table 601, 602

1.11.2. Interior Bearing walls - [ ] hour rating 1.11.3. Structural frame - [ ] hour rating 1.11.4. Permanent partitions - [\_\_\_\_] hour rating Shaft enclosures - [\_\_\_\_] hour rating 1.11.5. 1.11.6. Floors & Floor-Ceilings - [\_\_\_\_] hour rating 1.11.7. Roofs and Roof Ceilings - [ ] hour rating 1.12. Automatic Sprinklers and others used to determine the need for automatic Extinguishing Equipment, Extinguishing Systems, Foam Systems, Standpipe UFC 3-600-01, chapters 4 and 6 systems, wet chemical systems, etc. State which systems 1.12.1. are required and to what criteria they will be designed. UFC 3-600-01, Appendix B Occupancy Classification. Note the classification for each room. This may be accomplished by classifying the entire building and noting exceptions for rooms that differ (E.g. The entire building is Light Hazard except boiler room and storage rooms which are [ ], etc.) UFC 3-600-01, Chapter 3 Sprinkler Design Density, Sprinkler Design Area, Water Demand for Hose Streams (supply pressure and source requirements). UFC 3-600-01, Chapter 4 Coverage per sprinkler head. Extended coverage sprinkler heads 1.12.4. are not permitted. Available Water Supply. Provide the results of the water flow tests showing the available 1.12.5. water supply static pressure and residual pressure at flow. Based on this data and the estimated flow and pressure required for the sprinkler system, determine the need for a fire pump. 1.12.6. NFPA 13, Para. 8.16.4.6.1. Provide backflow preventer valves as required by the local municipality, authority, or water purveyor. Provide a test valve located downstream of the backflow preventer for flow testing the backflow preventer at full system demand flow. Route the discharge to an appropriate location outside the building. 1.13. Kitchen Cooking Exhaust Equipment Describe when kitchen cooking exhaust equipment is provided for the project. Type of extinguishing systems for the equipment should be provided, per NFPA 96. Show all interlocks with manual release switches, fuel shutoff valves, electrical shunt trips, exhaust fans, and building alarms. 1.14. Portable Fire Extinguishers, fire classification and travel distance, per NFPA 10 1.15. Enclosure Protection and Penetration Requirements. - Opening Protectives and Through Penetrations 1.15.1. IBC Section712, 715 and Table 715.3. Mechanical rooms, exit stairways, storage rooms, hour rating. IBC Table 302.1.1 janitor [

Fire Blocks, Draft Stops, Through Penetrations and Opening Protectives

Section 716 and NFPA 90A). State whether isolation smoke dampers are required at the air handler.

Fire Dampers. Describe where fire dampers and smoke dampers are to be used (IBC

Section: 01 33 16

1.15.2.

1.16.

- 1.17. Detection Alarm and Communication. UFC 3-600-01, (Chapter 5); NFPA 101 para. 3.4 (chapters 12-42); NFPA 72
- 1.18. Mass Notification. Describe building/facility mass notification system (UFC 4-021-01) type and type of base-wide mass notification/communication system. State whether the visible notification appliances will be combined with the fire alarm system or kept separate. (Note: Navy has taken position to combine visible notification appliances with fire alarm).
- 1.19. Interior Finishes (classification). NFPA 101.10.2.3 and NFPA 101.7.1.4
- 1.20. Means of Egress
- 1.20.1. Separation of Means of Egress, NFPA 101 chapters 7 and 12-42; NFPA101.7.1.3
- 1.20.2. Occupant Load, NFPA101.7.3.1 and chapters 12-42.
- 1.20.3. Egress Capacity (stairs, corridors, ramps and doors) NFPA101.7.3.3
- 1.20.4. Number of Means of Egress, NFPA101.7.4 and chapters 12-42.
- 1.20.5. Dead end limits and Common Path of Travel, NFPA 101.7.5.1.6 and chapters 12-42.
- 1.20.6. Accessible Means of Egress (for accessible buildings), NFPA101.7.5.4
- 1.20.7. Measurement of Travel Distance to Exits, NFPA101.7.6 and chapters 12-42.
- 1.20.8. Discharge from Exits, NFPA101.7.7.2
- 1.20.9. Illumination of Means of Egress, NFPA101.7.8
- 1.20.10. Emergency Lighting, NFPA101.7.9
- 1.20.11. Marking of Means of Egress, NFPA101.7.10
- 1.21. Elevators, UFC 3-600-01, Chapter 6; IBC and ASME A17.1 2000,(Safety Code for Elevators and Escalators)
- 1.22. Accessibility Requirements, ADA and ABA Accessibility Guidelines for Buildings and Facilities
- 1.23. Certification of Fire Protection and Life Safety Code Requirements. (Note: Edit the Fire team membership if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features for this project in accordance with the attached completed form(s).
- 1.24. Designer of Record. Certification of Fire protection and Life Safety Code Requirements. (Note: Edit the Fire team members if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features of this project.

Fire Protection Engineer of Record:

Signature and Stamp

Date

OR	
Architect of Record:	
Signature and Stamp	
Date	
Mechanical Engineer of Record:	
Signature and Stamp	
Date	
Electrical Engineer of Record:	
Signature/Date	

## ATTACHMENT E LEED SUBMITTALS

Section: 01 33 16

LEED Submittals W912QR-23413770 CERTIFIED FINAL-003 Section: 01 33 16 Page 185 of 947 Submitted (to be filled in by Contractor) is Claimed Here if Credit Credit Audit Only Sovernment Reviewer's Use EED Credit Paragraph Check Provide for LEED-NC v3 Submittals (OCT09) PAR **FEATURE** DUE AT REQUIRED DOCUMENTATION GENE GENERAL - All calculations shall be in accordance with LEED 2009 Reference Guide GENERAL: Obtain excel version of this spreadsheet at http://en.sas.usace.army.mil/enWeb, "Engineering Criteria" GENERAL - For all credits, narrative/comments may be added to describe special circumstances or considerations regarding the project's credit approach GENERAL - Include all required LEED drawings indicated below in contract drawings with applicable discipline drawings, labeled For Reference Only NOTE: Each submittal indicated with "\*\*" differs from LEED certified project submittals by either having a different due date or being an added submittal not required by GBCI NOTE: Projects seeking LEED certification need only submit to GBCI whatever documentation is acceptable to GBCI (for example, licensed professional certifications). This checklist identifies what must be submitted to the Government for internal review purposes. Government review of LEED documentation in no way supercedes or modifies the requirements and rulings of of GBCI for purposes of compliance with project requirement to obtain LEED certifiaction. GENERAL - Audit documentation may include but is not limited to what is indicated in this table. List of all Final Design submittals revised after final design to reflect actual closeout conditions. Revised Final Design submittals. - OR - Statement confirming that no Proj changes have been made since final design that effect final design submittal Engr (PE) Closeout documents. **CATEGORY 1 - SUSTAINABLE SITES** Construction Activity Pollution List of drawings and specifications that address the erosion control, particulate/dust SSPR1 Prevention (PREREQUISITE) \*Final Design control and sedimentation control measures to be implemented CIV \*\*Final Design Delineation and labeling of "LEED Project site boundary" on site plan. CIV Narrative that indicates which compliance path was used (NPDES or Local standards) and describes the measures to be implemented on the project. If a local standard was followed, provide specific information to demonstrate that the local \*\*Final Design standard is equal to or more stringent than the NPDES program CIV Final Design Statement confirming that project does not meet any of the prohibited criteria. Delineation and labeling of "LEED Project site boundary" on site plan. CIV SS<sub>1</sub> Site Selection \*\*Final Design CIV LEED Site plan drawing that shows all proposed development, line depicting boundary of all bodies of water and/or wetlands within 100 feet of project boundary and a line depicting 5' elevation above 100 year flood line that falls within project Final Design boundary. Not required if neither condition applies CIV **Development Density & Community** Option 1: LEED Site vicinity plan showing project site and surrounding development SS2 Final Design Show density boundary or note drawing scale CIV Connectivity \*\*Final Design Delineation and labeling of "LEED Project site boundary" on site plan. CIV Option 1: Table indicating, for project site and all surrounding sites within density radius (keyed to site vicinity plan), site area and building area. Project development density calculation. Density radius calculation. Development density calculation Final Design CIV within density radius. Option 2: LEED Site vicinity plan showing project site, the 1/2 mile community radius pedestrian walkways and the locations of the residential development(s) and Basic Final Design Services surrounding the project site. CIV Option 2: List (including business name and type) of all Basic Services facilities Final Design within the 1/2 mile radius, keyed to site vicinity plan CIV Narrative describing contamination and the remediation activities included in project Final Design Include statement indicating how site was determined to be a brownfield.

Delineation and labeling of "LEED Project site boundary" on site plan.

Statement indicating which option for compliance applies. State whether public SS3 Brownfield Redevelopment CIV \*\*Final Design CIV Alternative Transportation: Public transportation is existing or proposed and, if proposed, cite source of this Final Design CIV SS4.1 Transportation Access information. Delineation and labeling of "LEED Project site boundary" on site plan. CIV \*\*Final Design Option 1: LEED Site vicinity plan showing project site, mass transit stops and Final Design CIV pedestrian path to them with path distance noted. Option 2: LEED Site vicinity plan showing project site, bus stops and pedestrian path Final Design CIV o them with path distance noted Alternative Transportation: Bicycle TE calculation. Bicycle storage spaces calculation. Shower/changing facilities SS4.2 Storage & Changing Rooms Final Design calculation CIV List of drawings that show the location(s) of bicycle storage areas. Statement Final Design CIV ndicating distance from building entrance List of drawings that show the location(s) of shower/changing facilities and, if located

Final Design

outside the building, statement indicating distance from building entrance.

Se	ction: (	01 33	16

	Section, 01 33 10				W912QR-23413770 CERTIFIED FINAL		
					Page 186 o	1947	
LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
PAR		FEATURE	DUE AT		REQUIRED DOCUMENTATION	DATE	REV
		Alternative Transportation: Low Emitting	1	I	Statement indicating which option for compliance applies. FTE calculation.		
SS4.3		& Fuel Efficient Vehicles	Final Design		Statement indicating total parking capacity of site.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
	1		Final Design		Option 1: Low-emission & fuel-efficient vehicle calculation.  Option 1: List of drawings and specification references that show location and		CIV
			Final Design		number of preferred parking spaces for low-emission & fuel-efficient vehicles and signage.		CIV
			Final Design		Option 1: Statement indicating quantity, make, model and manufacturer of low- emission & fuel-efficient vehicles to be provided. Statement confirming vehicles are zero-emission or indicating ACEEE vehicle scores.		CIV
	1		Final Design		Option 2: Low-emission & fuel-efficient vehicle parking calculation.		CIV
			Final Design		Option 2: List of drawings and specification references that show location and number of preferred parking spaces and signage.		CIV
			Final Design		Option 3: Low-emission & fuel-efficient vehicle refueling station calculation.		CIV
			Final Design		Option 3: List of drawings and specifications indicating location and number of refueling stations, fuel type and fueling capacity for each station for an 8-hour period. Option 3: Construction product submittals indicating what was provided and		CIV
			Closeout	Х	confirming compliance with respect to fuel type and fueling capacity for each station for an 8-hour period.		CIV
		Alternative Transportation: Parking					
SS4.4		Capacity	Final Design		Statement indicating which option for compliance applies.		CIV
	-		**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.  Option 1: Preferred parking calculation including number of spaces required, total		CIV
			Final Design		provided, preferred spaces provided and percentage.		CIV
			-		Option 2: FTE calculation. Preferred parking calculation including number of spaces		
			Final Design	-	provided, preferred spaces provided and percentage.  Options 1 and 2: List of drawings and specification references that show location and		CIV
			Final Design		number of preferred parking spaces and signage.		CIV
			Final Design		Option 3: Narrative indicating number of spaces required and provided and describing infrastructure and support programs with description of project features to support them.		CIV
	I	Site Development: Protect or Restore	1		Option 1: List of drawing and specification references that convey site disturbance		ı
SS5.1	<u> </u>	Habitat	**Final Design	L	limits.		CIV
	<b>↓</b> _		**Final Design	$\perp$	Delineation and labeling of "LEED Project site boundary" on site plan.  Option 2: LEED site plan drawing that delineates boundaries of each preserved and		CIV
			**Final Design		Option 2: LEED site pian drawing that delineates boundaries of each preserved and restored habitat area with area (sf) noted for each.  Option 2: Percentage calculation of restored/preserved habitat to total site area. List		CIV
			**Final Design		of drawings and specification references that convey restoration planting requirements.		CIV
					Option 2: LEED site plan drawing delineating boundary of vegetated open space		
		Site Development: Maximize Open			adjacent to building with areas of building footprint and designated open space		
SS5.2	1	Space	Final Design	-	noted.		CIV
	1	I	**Final Design	<u> </u>	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS6.1		Stormwater Design: Quantity Control	Final Design		Statement indicating which option for compliance applies.		CIV
ļ	1		**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
					Option 1: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf) -OR - Narrative describing site conditions, measures and controls to be		
			Final Design		implemented to prevent excessive stream velocities and erosion.		CIV
			Final Design		Option 2: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf). Indicate percent reduction in each.		CIV
SS6.2		Stormwater Design: Quality Control	Final Design **Final Design		For non-structural controls, list all BMPs used and, for each, describe the function of the BMP and indicate the percent annual rainfall treated. List all structural controls and, for each, describe the pollutant removal and indicate the percent annual rainfall treated.  Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS7.1		Heat Island Effect: Non-Roof	**Final Design		LEED site plan drawing indicating locations and quantities of each paving type, including areas of shaded pavement. Percentage calculation indicating percentage of reflective/shaded/open grid area.		CIV
<u> </u>	1	<u> </u>	rınaı Design	1	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV

Section:	Λ1	33	16

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					Page 187 o	1947	
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					Option 1: Percentage calculation indicating percentage of SRI compliant roof area.		1
SS7.2		Heat Island Effect: Roof	Final Design		List of drawings and specification references that convey SRI requirements and roof slopes.		ARC
					Option 1: List of specified roof materials indicating, for each, type, manufacturer,		
			Final Design		product name and identification if known, SRI value and roof slope.		ARC
					Option 1: List of installed roof materials indicating, for each, manufacturer, product		
			**Closeout		name and identification, SRI value and roof slope.		PE
			Closeout	Х	Option 1: Manufacturer published product data or certification confirming SRI		PE
			Final Design Final Design		Option 2: Percentage calculation indicating percentage of vegetated roof area.  Option 3: Combined reflective and green roof calculation.		ARC ARC
			Final Design		Option 3. Combined reflective and green roof calculation.		ARC
			Final Design		Option 3: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope.		ARC
			**********		Option 3: List of installed roof materials indicating, for each, manufacturer, product		DE.
			**Closeout Closeout	Х	name and identification, SRI value and roof slope.  Option 3: Manufacturer published product data or certification confirming SRI		PE PE
SS8		Light Pollution Reduction	Final Design		Interior Lighting: List of drawings and specification references that convey interior lighting requirements (location and type of all installed interior lighting, location of non-opaque exterior envelope surfaces, allowing confirmation that maximum candela value from interiorfixtures does not intersect non-opaque building envelope surfaces).  - OR - List of drawings and specification references that show automatic lighting controls compliance with credit requirement.		ELEC
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.  Exterior Lighting: List of drawings and specification references that convey exterior		ELEC
			Final Design		lighting requirements (location and type of all site lighting and building façade/landscape lighting).		ELEC
			Final Design		Exterior Site Lighting Power Density (LPD): Tabulation for exterior site lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all site lighting.		ELEC
			Final Design		Exterior Building Facade/Landscape Lighting Power Density (LPD): Tabulation for exterior building facade/landscape lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all building facade/landscape lighting.		ELEC
	$\vdash$		Final Design		Exterior Lighting IESNA Zone: Indicate which IESNA zone is applicable to the		ELEC
			Final Design		project.		ELEC
			Final Design		Exterior Lighting Site Lumen table indicating, for each fixture type, quantity installed, initial lamp lumens per luminaire, initial lamp lumens above 90 degrees from Nadir, total lamp lumens and total lamp lumens above 90 degrees. Percentage of site lamp lumens above 90 degrees from nadir to total lamp lumens.		ELEC
			Final Design		Exterior Lighting Narrative describing analysis used for addressing requirements for light trespass at site boundary and beyond.		ELEC
CATECO	DV 1	- WATER EFFICIENCY	- 3				
CATEGO	rt 2	- WATER EFFICIENCY					
WEPR1		Water Use Reduction: 20% Reduction	Final Design		Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design		Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users		MEC
					Statement indicating percent of male restrooms with urinals. Statement indicating		
L	1	l	Final Design		annual days of operation.		MEC

Section:	Λ1	22	16
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					Page 188 o	1947	
LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
PAR		FEATURE	DUE AT		REQUIRED DOCUMENTATION	DATE	REV
			Final Design		Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.  Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants		MEC
			Final Design		using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.		MEC
			Closeout	Y	Manufacturer published product data or certification confirming fixture water usage.		PE
		Water Efficient Landscaping: Reduce by		^			
WE1.1		50%	Final Design **Final Design		Statement indicating which option for compliance applies.  Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design Final Design		Calculation indicating, for baseline and design case, total water applied, total potable water applied, total non-potable water applied. Design case percent potable water reduction. If nonpotable water is used, indicate source of nonpotable water. List of landscape plan drawings.		CIV
		Water Efficient Landscaping: No	Final Design		Narrative describing landscaping and irrigation design strategies, including water use calculation methodology used to determine savings and, if non-potable water is used, specific information about source and available quantity.		CIV
WE1.2		Potable Water Use or No Irrigation	Same as WE1.1		Same as WE1.1		CIV
WE2		Innovative Wastewater Technologies	Final Design		Statement confirming which option for compliance applies.		MEC
			Final Design		Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design		Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users Statement indicating percent of male restrooms with urinals. Statement indicating		MEC
			Final Design		annual days of operation.		MEC
			Final Design		Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.		MEC
			Final Design		Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.  Option 1: If onsite non-potable water is used, identify source(s), indicate annual		MEC
			Final Design		quantity from each source and indicate total annual quantity from all onsite non- potable water sources.		MEC
			Final Design		Option 1: Summary calculation indicating baseline annual water consumption, design case annual water consumption, non-potable annual water consumption and total percentage annual water savings.		MEC
			Final Design Final Design		Option 2: Statement confirming on-site treatment of all generated wastewater to tertiary standards and all treated wastewater is either infiltrated or used on-site.  Option 2: List of drawing and specification references that convey design of on-site wastewater treatment features.		MEC CIV
			Final Design		Option 2: On-site water treatment quantity calculation indicating all on-site wastewater source(s), annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from each source and totals for annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from all sources.		CIV
			Final Design		Option 2: Wastewater summary calculation indicating design case annual flush fixture water usage, annual on-site water treatment and percentage sewage convyance reduction.  Narrative describing project strategy for reduction of potable water use for sewage conveyance, including specific information on reclaimed water usage and treated		MEC
WE3		Water Use Reduction: 30% - 40%	Final Design		wastewater usage.		MEC
LVV E.3	1	Reduction - ENERGY AND ATMOSPHERE	Same as WEPR1		Same as WEPR1		MEC

Section:	Λ1	33	16
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	3ection: 01 33 10				Page 189 of 947				
					Page 189 o	1947			
A LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)	DUE AT	Provide for Credit Audit Only	REQUIRED DOCUMENTATION	Date Submitted (to be filled in by Contractor)	Government Reviewer's Use		
IAK		Fundamental Commissioning of the	DOLAI		NEGONED BOOMERIATION	DAIL	IXEV		
EAPR1		Building Energy Systems (PREREQUISITE)	**Final Design		**Owner's Project Requirements document		ALL MEC,		
			**Final Design		**Basis of Design document for commissioned systems		ELEC MEC,		
			**Final Design		**Commissioning Plan		ELEC,		
			Closeout		Statement confirming all commissioning requirements have been incorporated into construction documents.		PE		
			Closeout		Commissioning Report Statement listing the mandatory provisions of ASHRAE 90.1 that project meets		PE MEC		
EAPR2		Minimum Energy Performance (PREREQUISITE)	Final Design		relative to compliance with this prerequisite and indicating which compliance path was used.		ELEC ARC		
		, , , , , , , , , , , , , , , , , , , ,	Final Design		Statement indicating which compliance path option applies.  Option 1: Statement confirming simulation software capabilities and confirming		MEC		
			Final Design		assumptions and methodology.		MEC		
					Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star				
			Final Design		Target Finder score.		MEC		
			Final Design		Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category		MEC		
			Final Design		Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design		MEC		
			Final Design Final Design		Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand		MEC MEC		
			Final Design		Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC		
			Final Design		Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC		
			r mai Design		Option 1: If analysis includes exceptional calculation methods, for each exceptional		IVILO		
			Final Design		calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC		
			Final Design		Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC		
					Option 1: Baseline energy cost table indicating, for each energy type, annual cost for				
			Final Design		all four orientations and building total energy cost.		MEC		
			Final Design		Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.		MEC		
			Final Design		Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC		
			Final Design		Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC		

Section:	Λ1	22	16
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		Clion. 01 33 10			W912QN-23413110 CENTIFIED FINAL		
					Page 190 o	f 947	
LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Govemment Reviewer's Use
PAR		FEATURE	DUE AT		REQUIRED DOCUMENTATION	DATE	REV
			Final Design		Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features  Option 1: Energy rate tariff from project energy providers (only if not using LEED		MEC
		Fundamental Refrigerant Management	Final Design		Reference Guide default rates)		MEC
EAPR3		(PREREQUISITE)	Final Design		Statement indicating which option for compliance applies.  Option 2: Narrative describing phase out plan, including specific information on		MEC
			Final Design		phase out dates and refrigerant quantities.		MEC
EA1		Optimize Energy Performance	Final Design		Statement indicating which compliance path option applies.  Option 1: Statement confirming simulation software capabilities and confirming		MEC
			Final Design		assumptions and methodology.		MEC
					Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star		
			Final Design		Target Finder score.		MEC
			Final Design		Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category Option 1: List of all simulation output advisory message data and show difference		MEC
			Final Design		between baseline and proposed design		MEC
			Final Design Final Design		Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand		MEC MEC
			Final Design		Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC
			Final Design		Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC
					Option 1: Baseline energy cost table indicating, for each energy type, annual cost for		
			Final Design  Final Design		all four orientations and building total energy cost.  Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.  Option 1: Proposed Design energy cost table indicating, for each energy type, annual		MEC
			Final Design  Final Design		cost for all four orientations and building total energy cost.  Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC

Section:	Λ1	33	16
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					Page 191 o	1947	
LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
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			Final Design		Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features  Option 1: Energy rate tariff from project energy providers (only if not using LEED		MEC
EA2.1		On-Site Renewable Energy	Final Design Final Design		Reference Guide default rates) Statement indicating which compliance path option applies.		MEC ELEC
LAZ. I		On one renewable Energy	Final Design		List all on-site renewable energy sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost. Indicate total annual energy use (all sources), total annual energy cost (all sources) and percent renewable energy cost.  Option 1: Indicate, for renewable energy, proposed design total annual energy		ELEC MEC ELEC
	-		Final Design		generated and annual cost.		MEC
			Final Design Final Design		Option 2: Indicate CBECS building type and building gross area. Provide the following CBECS data: median annual electrical intensity, median annual non-electrical fuel intensity, average electric energy cost, average non-electric fuel cost, annual electric energy use and cost, annual non-electric fuel use and cost. Option 2: Narrative describing renewable systems and explaining calculation method used to estimate annual energy generated, including factors influencing performance.		ELEC MEC ELEC MEC
EA2.2		On-Site Renewable Energy	Same as EA2.1		Same as EA2.1		ELEC MEC
EA2.3 EA3		On-Site Renewable Energy Enhanced Commissioning	Same as EA2.1  **Final Design		Same as EA2.1 **Owner's Project Requirements document (OPR)		ELEC MEC ALL
			**Final Design		**Basis of Design document for commissioned systems (BOD)		ELEC MEC
			**Final Design		**Commissioning Plan		ELEC MEC
			-		Statement confirming all commissioning requirements have been incorporated into		
			Closeout Closeout		construction documents.  **Commissioning Report		PE PE
			**Final Design		Statement by CxA confirming Commissioning Design Review		
			Closeout		Statement by CxA confirming review of Contractor submittals for compliance with OPR and BOD		PE
			Closeout		**Systems Manual		PE
			Closeout		Statement by CxA confirming completion of O&M staff and occupant training		PE
					**Scope of work for post-occupancy review of building operation, including plan for		
			Closeout		resolution of outstanding issues		PE
			**Predesign		Statement confirming CxA qualifications and contractual relationships relative to work on this project, demonstrating that CxA is an independent third party.		MEC
EA4		Enhanced Refrigerant Management	Final Design		Refrigerant impact calculation table with all building data and calculation values as shown in LEED 2009 Reference Guide Example Calculations		MEC
	_		Final Design	V	Narrative describing any special circumstances or explanatory remarks		DE
EA5	L	Measurement & Verification	Closeout Closeout	Х	Cut sheets highlighting refrigerant data for all HVAC components.  Statement indicating which compliance path option applies.		PE PE
			Closeout		Measurement and Verification Plan including Corrective Action Plan		PE
	1		Closeout		**Scope of work for post-occupancy implementation of M&V plan including corrective action plan.		PE
EA6		Green Power	Closeout		Statement indicating which compliance path option applies.		PE
		3.00 001	Closeout		Option 1: Indicate proposed design total annual electric energy usage		PE
			Closeout		Option 2: Indicate actual total annual electric energy usage		PE
					Option 3: Calculation indicating building type, total gross area, median electrical		
<u> </u>		<u> </u>	Closeout	<u> </u>	intensity and annual electric energy use		PE

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			Closeout		Green power provider summary table indicating, for each purchase type, provider name, annual quantity green power purchased and contract term. Indicate total annual green power use and indicate percent green power		PE
			Closeout		Narrative describing how Green Power or Green Tags are purchased	<u> </u>	PE
CATEGO	RY 4	- MATERIALS AND RESOURCES					
MRPR1		Storage & Collection of Recyclables (PREREQUISITE)	Final Design		Statement confirming that recycling area will accommodate recycling of plastic, metal, paper, cardboard and glass. Narrative indicating any other materials addressed and coordination with pickup.		ARC
MD1 1		Building Reuse: Maintain 55% of	**Final Design		If project includes a building addition, confirm that area of building addition does not		٨٥٥
MR1.1		Existing Walls, Floors & Roof	**Final Design		exceed 2x the area of the existing building.  Spreadsheet listing, for each building structural/envelope element, the existing area		ARC
		Duilding Davis Maintain 750/ of	**Final Design		and reused area. Total percent reused.	<u> </u>	ARC
MR1.2		Building Reuse: Maintain 75% of Existing Walls, Floors & Roof	Same as MR1.1		Same as MR1.1		ARC
		Building Reuse: Maintain 95% of					
MR1.3		Existing Walls, Floors & Roof	Same as MR1.1		Same as MR1.1	<del>                                     </del>	ARC
MR1.4		Building Reuse: Maintain 50% of Interior Non-Structural Elements	**Final Design		If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building.		ARC
			**Final Design		Spreadsheet listing, for each building interior non-structural element, the existing area and reused area. Total percent reused.		ARC
MR2.1		Construction Waste Management: Divert 50% From Disposal	**Preconstruction  **Construction Quarterly and		Waste Management Plan  Spreadsheet calculations indicating material description, disposal/diversion location (or recycling hauler), weight, total waste generated, total waste diverted, diversion		PE
			Closeout  **Construction Quarterly and Closeout		percentage  Receipts/tickets for all items on spreadsheet		PE PE
MDOO		Construction Waste Management:	Come on MDO 4		Comp. on MD0.4		חר
MR2.2		Divert 75% From Disposal	Same as MR2.1		Same as MR2.1		PE
MR3.1		Materials Reuse: 5%	Closeout		Statement indicating total materials value and whether default or actual.		PE
MR3.2		Materials Reuse: 10%	Closeout Same as MR3.1		Spreadsheet calculations indicating, for each reused/salvaged material, material description, source or vendor, cost. Total reused/salvaged materials percentage. Same as MR3.1		PE PE
MR4.1		Recycled Content: 10% (post- consumer + 1/2 pre-consumer)	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each recycled content material, material name/description, manufacturer, cost, post-consumer recycled content percent, preconsumer recycled content percent, source of recycled content data. Total post-consumer content materials cost, total pre-consumer content materials cost, total combined recycled content materials cost, recycled content materials percentage.		PE
			Final Design or		combined recycled content materials cost, recycled content materials percentage.		rc_
			NLT Preconstruction		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	Х	Manufacturer published product data or certification, confirming recycled content percentages in spreadsheet	1	PE
MR4.2		Recycled Content: 20% (post- consumer + 1/2 pre-consumer)	Same as MR4.1		Same as MR4.1		PE
MR5.1		Regional Materials:10% Extracted, Processed & Manufactured Regionally	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Classe :		Spreadsheet calculations indicating, for each regional material, material name/description, manufacturer, cost, percent compliant, harvest distance, manufacture distance, source of manufacture and harvest location data. Total		סר
			Closeout		regional materials cost, regional materials percentage.  **Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated	<del>                                     </del>	PE
			Preconstruction		quantities to show strategy for achieving goal.	<u> </u>	PE
			Closeout	х	Manufacturer published product data or certification confirming regional material percentages in spreadsheet	1	PE
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MR5.2		Regional Materials:20% Extracted, Processed & Manufactured Regionally	Same as MR5.1		Same as MR5.1		PE
MDC		Danielle Danassahla Matariala	Classaut		Chatananat indication total materials unless and substitute data. It as actual		DE
MR6		Rapidly Renewable Materials	Closeout		Statement indicating total materials value and whether default or actual.  Spreadsheet calculations indicating, for each rapidly renewable material, material name/description, manufacturer, cost, rapidly renewable content percent, rapidly renewable product value. Total rapidly renewable product value, rapidly renewable materials percentage.		PE PE
			Final Design		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		ARC
			Closeout	Х	Manufacturer published product data or certification confirming rapidly renewable material percentages in spreadsheet		PE
MR7		Certified Wood	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each certified wood material, material name/description, vendor, cost, wood component percent, certified wood percent of wood component, FSC chain of custody certificate number. Total certified wood product value, certified wood materials percentage.		PE
			Final Design or NLT		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated		
			Preconstruction		quantities to show strategy for achieving goal.  Vendor invoices, FSC chain of custody certificates and anufacturer published product data or certification confirming all certified wood materials percentages in		PE
			Closeout	Χ	spreadsheet.		PE
INDOOR	ENV	IRONMENTAL QUALITY	I		Statement indicating which option for compliance applies, stating applicable		
EQPR1		Minimum IAQ Performance (PREREQUISITE)	Final Design		criteria/requirement, and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design, including specifics about fresh air intake volumes and special considerations.  Statement indicating which option for compliance applies, stating applicable		MEC
EQPR2		Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Final Design		criteria/requirement, and confirming that project has been designed to meet the applicable requirements.		ARC
			Final Design		List of drawing and specification references that convey conformance to applicable requirements (signage, exhaust system, room separation details, etc).		ARC
EQ1		Outdoor Air Delivery Monitoring	Final Design Final Design		Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.  List of drawing and specification references that convey conformance to applicable requirements.		MEC MEC
			Final Design Closeout		Narrative describing the project's ventilation design and CO2 monitoring system, including specifics about monitors, operational parameters and setpoints.  Cut sheets for CO2 monitoring system.		MEC PE
EQ2		Increased Ventilation	Final Design		Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design, including specifics about zone fresh air intake volumes and demonstrating compliance.		MEC
					Tresh air intake volumes and demonstrating compliance.  Option 2: Narrative describing design method used for determining natural ventilation design, including calculation methodology/model results and demonstrating compliance.		MEC
			Final Design		List of drawing and specification references that convey conformance to applicable		
	-	Construction IAQ Management Plan:	Final Design		requirements.		MEC
EQ3.1		During Construction	**Preconstruction		Construction IAQ Management Plan		PE
			Closeout		Statement confirming whether air handling units were operated during construction		PE
			Closeout		Dated jobsite photos showing examples of IAQ management plan practices being implemented. Label photos to indicate which practice they demonstrate. Minimum one photo of each practice at each building.		PE

Section:	$\Omega$ 1	22	16	1
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			Closeout		Spreadsheet indicating, for each filter installed during construction, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy.		PE	
EQ3.2		Construction IAQ Management Plan:  Before Occupancy	**Preconstruction		Construction IAQ Management Plan		PE	
			Closeout		Statement indicating which option for compliance applies and confirming that required activities have occurred that meet the applicable requirements.  Option 1a: Narrative describing the project's flushout process, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE PE	
			Closeout		Option 1b: Narrative describing the project's pre-occupancy and post-occupancy flushout processes, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE	
			Closeout		Option 2: Narrative describing the project's IAQ testing process, including specifics about contaminants tested for, locations, remaining work at time of test, retest parameters and special considerations (if any).		PE	
	+		Closeout		Option 2: IAQ testing report demonstrating compliance.  Spreadsheet indicating, for each applicable indoor adhesive, sealant and sealant		PE	
EQ4.1		Low Emitting Materials: Adhesives & Sealants	Closeout		primer used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE	
			Closeout		Spreadsheet indicating, for each applicable indoor aerosol adhesive, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor aerosol adhesives were used for the project.		PE	
					Manufacturer published product data or certification confirming material VOCs in			
EQ4.2		Low Emitting Materials: Paints & Coatings	Closeout  Closeout	X	spreadsheet Spreadsheet indicating, for each applicable indoor paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE PE	
LQ4.2		Coaungs	Closeout	X	Spreadsheet indicating, for each applicable indoor anti-corrosive/anti-rust paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor anti-corrosive/anti-rust paints were used for the project.  Manufacturer published product data or certification confirming material VOCs in spreadsheet		PE PE	
EQ4.3		Low Emitting Materials: Flooring Systems	Closeout		Spreadsheet indicating, for each indoor flooring system used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data.		PE	
			Closeout		Spreadsheet indicating, for each indoor carpet cushion used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data - OR - Statement confirming no indoor carpet cushion was used for the project.		PE	
			Closeout	Y	Manufacturer published product data or certification confirming material compliance label in spreadsheet		PE	
EQ4.4		Low Emitting Materials: Composite Wood & Agrifiber Products	Closeout		Spreadsheet indicating, for each indoor composite wood and agrifiber product used, the manufacturer, product name/model number, if it contains added urea formaldehyde (yes/no) and source of LEED compliance data.  Manufacturer published product data or certification confirming material urea		PE	
			Closeout	Х	formaldehyde in spreadsheet		PE	
EQ5		Indoor Chemical & Pollutant Source Control	Closeout		Spreadsheet indicating, for each permanent entryway system used, the manufacturer, product name/model number and description of system.		PE	
			Final Design		List of drawing and specification references that convey locations and installation methods for entryway systems.		ARC	
			Final Design		Spreadsheet indicating, for each chemical use area, the room number, room name, description of room separation features (walls, floor/ceilings, openings) and pressure differential from surrounding spaces with doors closed - OR - Statement confirming that project includes no chemical use areas and that no hazardous cleaning materials are needed for building maintenance. If project includes chemical use areas: List of drawing and specification references that convey locations of chemical use areas, room separation features and exhaust		ARC MEC	
			Final Design		system.		MEC	

Section:	$\Omega$ 1	22	16	1
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LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
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			Final Design		If project includes places where water and chemical concentrate mixing occurs: List of drawing and specification references that convey provisions for containment of hazardous liquid wastes OR - Statement confirming that project includes no places where water and chemical concentrate mixing occurs.		ARC MEC
			Classout		If project includes chemical use areas: Spreadsheet indicating, for AHUs/mechanical ventilation equipment serving occupied areas, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy (yes/no) - OR - Statement confirming that project does not use		DE
			Closeout	1	mechanical equipment for ventilation of occupied areas.  Calculation indicating total number of individual workstations, number of workstations		PE
EQ6.1		Controllability of Systems: Lighting	Final Design	1	with individual lighting controls and the percentage of workstations with individual lighting controls.		ELEC
			Final Design		For each shared multi-occupant space, provide a brief description of lighting controls.		ELEC
			Tinai Design				LLLO
		Controllability of Systems: Thermal	Final Design		Narrative describing lighting control strategy, including type and location of individual controls and type and location of controls in shared multi-occupant spaces. Calculation indicating total number of individual workstations, number of workstations with individual thermal comfort controls and the percentage of workstations with		ELEC
EQ6.2		Comfort Comfort	Final Design		individual thermal comfort controls.		MEC
			Final Design		For each shared multi-occupant space, provide a brief description of thermal comfort controls.		MEC
			Final Design		Narrative describing thermal comfort control strategy, including type and location of individual and shared multi-occupant controls.		MEC
EQ7.1		Thermal Comfort: Design	Final Design		Design criteria spreadsheet indicating, for spring, summer, fall and winter, maximum indoor space design temperature, minimum indoor space design temperature and maximum indoor space design humidity.  Narrative describing method used to establish thermal comfort control conditions and		MEC
			Final Design		how systems design addresses the design criteria, including compliance with the referenced standard.		MEC
EQ7.2		Thermal Comfort: Verification	Final Design		Narrative describing the scope of work for the thermal comfort survey, including corrective action plan development		MEC
LQ1.Z		Thermal Comot. Vermeation			List of drawing and specification references that convey permanent monitoring		
EQ8.1		Daylight & Views: Daylight 75% of Spaces	Final Design Final Design		system.  Option 2: Table indicating all regularly occupied spaces with space area and space area with compliant daylight zone. Sum of regularly occupied areas and regularly occupied areas withcompliant daylight zone. Percentage calculation of areas withcompliant daylight zone to total regularly occupied areas.		MEC
			Final Design		Option 1: Simulation model method, software and output data		ELEC
			Final Design		Option 1: Table indicating all regularly occupied spaces with space area, space area with minimum 25 footcandles daylighting illumination, and method of providing glare control. Sum of regularly occupied areas and regularly occupied areas with 25 fc daylighting. Percentage calculation of areas with 25 fc daylighting to total regularly occupied areas.		ELEC
					For all occupied spaces excluded from the calculation, provide narrative indicating		
			Final Design		reasons for excluding the space. List of drawing and specification references that convey exterior glazed opening head and sill heights, glazing performance properties and glare control/sunlight		ARC
			Final Design		redirection devices.  Manufacturer published product data or certification confirming glazing Tvis in		ARC
		Daylight & Views: Views for 90% of	Closeout	X	spreadsheet Table indicating all regularly occupied spaces with space area and space area with access to views. Sum of regularly occupied areas and regularly occupied areas with access to views. Percentage calculation of areas with views to total regularly		PE
EQ8.2		Spaces	Final Design	_	occupied areas.		ARC
			Final Design		For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space.		ARC
			Final Design		LEED Floor plan drawings showing line of sight diagramming of views areas in each regularly occupied space. List of drawing/specification references that convey exterior glazed opening head and sill heights.		ARC

Section:	01	33	1	6

					Page 196 o	f 947	
LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
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IDc1.1 IDc1.2 IDc1.3		Innovation in Design Innovation in Design Innovation in Design	Final Design Final Design Final Design		Narrative decribing intent, requirement for credit, project approach to the credit. List of drawings and specification references that convey implementation of credit. All other documentation that validates claimed credit.		
IDc1.4		Innovation in Design	Final Design		Newstra in the first consequent EED AD and a second of EED AD		
IDc2		LEED Accredited Professional	Final Design		Narrative indicating name of LEED AP, company name of LEED AP, description of LEED AP's role and responsibilities in the project.		ARC

#### <COS>ATTACHMENT F Version 09-13-2012

### **BUILDING INFORMATION MODELING REQUIREMENTS**

#### 1.0 Section 1 - General

1.1. Definitions. See Section 7 for definitions of terms used in this document.

#### 1.2. Submittal Format

- 1.2.1. The Model shall be developed using Building Information Modeling ("BIM") supplemented with Computer Aided Design ("CAD") content as necessary to produce a complete set of Construction Documents. Submitted drawings shall be Half Size size, suitable for half-size scaled reproduction.
- 1.2.2. BIM submittals shall conform to the requirements of Sections 3.0 and 4.0 below.
- 1.2.3. For each Center of Standardization (CoS) facility type included in this Project, all Models and associated Facility/Site Data shall be submitted in the BIM format and version as determined by the Customer, Geographic District BIM Manager, and the CoS District BIM Manager. For this project, the BIM submittal format will be . The submittals shall be fully operable, compatible, and editable within the native BIM tools.

#### 2.0 Section 2 – BIM Requirements

- 2.1. <u>Use of BIM</u>. Contractor shall use BIM application(s) and software(s) to develop Projects consistent with the following requirements.
- 2.1.1. <u>Baseline Model</u>. The Contractor will not be provided a baseline multi-discipline BIM Project Model.
- 2.1.2. BIM Program Configuration Standards.
- 2.1.3. <u>Reference.</u> Refer to ERDC TR-06-10, "U.S. Army Corps of Engineers Building Information Modeling Road Map" from the CAD/BIM Technology Center website for more information on the USACE BIM implementation goals.
- 2.1.4. <u>Industry Foundation Class (IFC) Support</u>. The Contractor's selected BIM application(s) and software(s) must be consistent with the current IFC property sets. Any deviations from or additions to the IFC property sets for any new spaces, systems, and equipment must be submitted for Government acceptance.
- 2.1.5. BIM Project Execution Plan.
- 2.1.5.1. Develop a BIM Project Execution Plan ("Plan" or "PxP") documenting mandatory and Contractorelected BIM Uses, analysis technologies and workflows.
- 2.1.5.2. Contractors shall use the USACE BIM PROJECT EXECUTION PLAN (PxP) Template located at <a href="https://cadbim.usace.army.mil">https://cadbim.usace.army.mil</a> to develop an acceptable Plan.

#### 2.2. BIM Content.

2.2.1. <u>Facility/Site Data</u>. Develop the Facility/Site Data to include material definitions and attributes that are necessary for the Project facility design and construction as described in Section 4.0. Additional data in support of Section 6.0 Contractor Electives is encouraged to be added to the Model.

- 2.2.2. <u>Model Content</u>. The Model and Facility/Site Data shall include, at a minimum, the requirements of Section 4.0 below.
- 2.3. <u>Output</u>. Submitted Drawings (e.g., plans, elevations, sections, schedules, details, etc.) shall be derived (commonly known as extractions, views or sheets) from the Model and Facility/Site Data. Drawings derived from the Model shall remain connected to the Model for the life of the Project and documented in the PxP. Drawings not derived from the Model shall also be documented in the PxP.
- 2.3.1. Drawings derived from the Model shall be compliant with the A/E/C CAD Standard. Deliver electronic CAD files used for the creation of the Construction Documents per requirements in Section 01 33 16, the criteria of the USACE [Not Supplied DistrictInfoGeneral : ISSUING\_DISTRICT] District, and as noted herein.
- 2.3.2. The CAD file format specified for drawings shall not dictate which application(s) are used for development and execution of the Model and Facility/Site Data. Application(s) used shall be documented in the PxP.
- 2.4. <u>Quality Control Parameters</u>. Implement quality control ("QC") parameters for the Model, including:
- 2.4.1. <u>Model Standards Checks</u>. Provide QC checks demonstrating that the Project Facility/Site Data set has no undefined, incorrectly defined or duplicated elements. Identify and report non-compliant elements and submit a corrective action plan. Provide the Government with detailed justification and request Government acceptance for any non-compliant element that the Contractor proposes to be allowed to remain in the Model.
- 2.4.2. <u>CAD Standards Checks</u>. Provide QC checks demonstrating that the fonts, dimensions, line styles, levels and other construction document formatting issues are followed per requirements in Section 01 33 16. Identify and report non-compliant content and submit a corrective action plan.
- 2.4.3. <u>Other Parameters</u>. Develop such other QC parameters as Contractor deems appropriate for the Project and provide to the Government for acceptance.
- 2.5. <u>Design and Construction Reviews.</u> The Model and Facility/Site Data will be used to perform reviews at each submittal stage under Section 3.0 to test the Model, including Over-The-Shoulder Progress Reviews:
- 2.5.1. <u>Visual Checks.</u> Checking to demonstrate the design intent has been followed and that there are no unintended elements in the Model.
- 2.5.2. <u>Interference Management Checks.</u> Locate conflicting spatial data in the Model where two elements are occupying the same space. Log hard interferences (e.g., mechanical vs. structural, or mechanical vs. mechanical, overlaps in the same location) and soft interferences, (e.g., conflicts regarding equipment clearance, service access, fireproofing, insulation, code space requirements) in a written report and resolve.
- 2.5.3. <u>Over-The-Shoulder Progress Reviews</u>. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model, including interference management and design change tracking information.
- 2.6. <u>Other Parameters.</u> Develop other design and construction review parameters as the Contractor deems appropriate for the Project and provide to the Government for acceptance.
- 3.0 Section 3 BIM Submittal Requirements

- 3.1. General Submittal Requirements.
- 3.1.1. Provide submittals in compliance with the PxP deliverables at stages as described below.
- 3.1.2. For each Submittal as set forth in Paragraphs 3.3 through 3.5, provide a Contractor-certified written report confirming that consistency checks as identified in Paragraphs 2.4 and 2.5 above have been completed. This report shall be discussed as part of the review process and shall address cross-discipline interferences, if any.
- 3.1.3. At each Submittal as set forth in Paragraphs 3.3 through 3.5, provide the Government with:
- 3.1.3.1. The Model, Facility/Site Data, Workspace and CAD Data files in the native BIM/CAD format.
- 3.1.3.2. A copy of the Model in an interactive review format such as Bentley Navigator, Autodesk Navisworks, Adobe 3D PDF 7.0 (or later), Google Earth KMZ or other format per PxP requirements. The format for reviews can change between submittals.
- 3.1.3.3. A list of all submitted electronic files including a description, directory, and file name for each file submitted. For all CAD printed sheets, include a list of the sheet titles and sheet numbers. Identify which files have been produced from the Model and Facility/Site Data.
- 3.1.3.4. <u>IFC Coordination View.</u> Provide an IFC Coordination View in IFC Express format for all deliverables. Provide exported property set data for all IFC supported named building elements.
- 3.1.4. The Government shall confirm acceptability of all submittals identified in Section 3.0 in coordination with the USACE Geographic District BIM Manager.
- 3.2. Initial Design Conference Submittal.
- 3.2.1. Submit a digital copy of the PxP and M3 where, in addition to Paragraph 3.1.4, the USACE Geographic District BIM Manager will coordinate with the USACE CoS BIM Manager to confirm acceptability of the Plan or advise as to additional processes or activities necessary to be incorporated into the PxP.
- 3.2.2. Within thirty (30) days after the acceptance of the PxP and M3, conduct a demonstration to review the Plan for clarification, and to verify the functionality of planned Model technology workflow and processes. If modifications are required, the Contractor shall complete the modifications and resubmit the PxP performing a subsequent demonstration for Government acceptance. There will be no payment for design or construction until the PxP is completed and accepted by the Government. The Government may also withhold payment if there is design and construction for unacceptable performance in executing the accepted PxP.
- 3.3. Interim Design Submittals.
- 3.3.1. <u>BIM and CAD Data</u>. Submit the Model with Facility/Site Data per the requirements identified in Paragraphs 2.2 and 2.3 as applicable to the Interim Design package(s).
- 3.4. Final Design Submissions and Design Complete Submittals.
- 3.4.1. <u>BIM and CAD Data</u>. Submit the Model with Facility/Site Data per the requirements identified in Paragraphs 2.2 and 2.3. Acceptance according to Paragraph 3.1.4 is required before commencement of construction, as described in Paragraph 3.7.6 of Section 01 33 16.

3.5. <u>Final As-Built BIM and CAD Data Submittal.</u> Submit the final Model, Facility/Site Data, and CAD files reflecting as-built construction conditions for Government acceptance, as specified in Section 01 78 02.00 10, Closeout Submittals.

#### 4.0 Section 4 – Minimum Modeling and Data Requirements

- 4.1. <u>Minimum Modeling Matrix (M3)</u>
- 4.1.1. Develop an M3 documenting elements included in the facility and site. The M3 describes the minimum modeling and data requirements by defining the Level of Development ("LOD") and Element Grade.
- 4.1.2. Contractors shall use the USACE Minimum Modeling Matrix (M3) Template located at <a href="https://cadbim.usace.army.mil">https://cadbim.usace.army.mil</a> and submitted as part of the PxP.
- 4.2. Additional Requirements.
- 4.2.1. <u>Classification</u>. All modeled elements shall include Facility/Site Data referencing one or more classification system(s).
- 4.2.2. <u>Spatial Data</u>. The Model shall include spatial data defining actual net square footage and net volume, and holding data to develop the room finish schedule including room names and numbers. Include program information to verify design space against programmed space, using this information to validate area quantities.
- 4.2.3. <u>Schedules.</u> Schedules shall be produced from the Facility/Site Data within the Model. Any exceptions should be documented in the PxP and submitted to the USACE for review.
- 4.2.4. <u>Details and Enlarged Sections.</u> All details and enlarged sections necessary for construction shall be derived from the Model when possible. For those details and enlarged sections not derived directly from the Model, Contractor must verify that geometry and data depicting the details and enlarged sections are consistent with Model elements. Details with significant drafted content such as 'standard' and 'typical' details shall not contradict the model and shall utilize the model as an underlay when possible for the purposes of verification and coordination. Three dimensional, isometric, and section isometric details derived from the model are preferred.
- 4.2.5. <u>Legends.</u> Model Elements shall be used to produce representations shown in the legends and shall match graphical representations shown in plans, sections, and elevations.
- 4.2.6. <u>Drawing Indices.</u> Where BIM authoring platform supports it, drawing indexes should be derived from a model-driven schedule.

#### 5.0 Section 5 - Ownership and Rights in Data

5.1. Ownership. The Government has ownership of and rights at the date of Closeout Submittal to all CAD files, BIM Model, and Facility/Site Data developed for the Project in accordance with FAR Part 27, clauses incorporated in Section 00 72 00, Contract Clauses and Special Contract Requirement 1.14 GOVERNMENT RE-USE OF DESIGN (Section 00 73 00). The Government may make use of this data following any deliverable.

#### 6.0 Section 6 – Contractor Electives

6.1. <u>Applicable Criteria.</u> If the Contractor elected to include one or more of the following features as an elective in its accepted contract proposal for additional credit, as described in the proposal submission

requirements and evaluation criteria, the requirements of paragraphs 6.2 through 6.5 are as applicable for those elective feature(s) that will be included in the project.

- 6.2. <u>COBIE Compliance.</u> The Model and Facility/Site Data for the Project shall fulfill Construction Operations Building Information Exchange (COBIE) requirements on the Whole Building Design Guide website (<a href="www.wbdg.org">www.wbdg.org</a>), including all requirements for the indexing and submission of Portable Document Format (PDF) and other appropriate records that would otherwise be printed and submitted in compliance with Project operations and maintenance handover requirements.
- 6.3. <u>Project Scheduling using the Model</u>. In the PxP and during the <u>Initial Design Conference</u> <u>Submittal</u> Demonstration, provide an overview of the use of BIM in the development and support of the Project construction schedule.
- 6.3.1. <u>Submittal Requirements</u>. During the Stages identified in Paragraphs 3.3 through 3.4, the Contractor shall deliver the construction schedule linked to the Model.
- 6.3.1.1. <u>Construction Submittals Over-The-Shoulder Progress Reviews</u>. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model for Project scheduling.
- 6.4. <u>Cost Estimating.</u> In the PxP and during the <u>Initial Design Conference Submittal</u> Demonstration, provide an overview of the use of BIM in the development and support of cost estimating, or other costing applications such as comparative cost analysis for proposed changes and estimate validation.
- 6.4.1. <u>Submittal Requirements</u>. During the Stages identified in Paragraphs 3.3 through 3.5, the Contractor shall deliver cost estimating information derived from the Model.
- 6.4.2. <u>Project Completion</u>. At Project completion, the Contractor shall provide an Micro Computer Aided Cost Estimating System Generation II ("MII") Cost Estimate that follows the USACE Cost Engineering Military Work Breakdown System ("WBS"), a modified Uniformat, to at least the sub-systems level and uses quantity information supplied directly from Model output to the maximum extent possible, though other "gap" quantity information will be included by the contractor as necessary for a complete and accurate Cost Estimate. (See Paragraph 6.4.2.2).
- 6.4.2.1. Sub system level extracted quantities from the Model for use within the Estimate shall be provided according to how detailed line items or tasks should be installed/built so that accurate costs can be developed and/or reflected. When developing a Model, the contractor shall be cognizant of construction sequencing at the beginning stages of Model development, such as recognizing tasks performed on the first floor versus the same task on higher floors that will be more labor intensive and, therefore, need to have a separate quantity and be priced differently. Tasks and their extracted quantities from the Model shall be broken down by their location (proximity in the structure) as well as the complexity of installation.
- 6.4.2.2. At all design Stages it shall be acknowledged that BIM output will not generate all quantities that are necessary in order to develop a complete and accurate cost estimate of the Project based on the design alone. (An example of this would be plumbing that is less than 1.5" diameter and, therefore, not expected to be modeled due to permitted level of design granularity; this information is commonly referred to as "The Gap". Quantities addressing "The Gap" and their associated costs shall be included in the final Project actual Cost Estimates as well even though not derived directly from the Model data).
- 6.5. Other Analyses and Reports. Structural, energy and efficiency, EPACT 2005 & EISA 2007, lighting design, daylighting, electrical power, psychrometric processing, shading, programming, LEED, fire protection, code compliance, Life Cycle Cost, acoustic, plumbing and other analyses that may be generated from the Model or reports summarizing the data compiled from these analyses shall be submitted in the form established by contractor in its accepted PxP.

#### 7.0 Definitions

- 7.1. The following definitions apply specifically to the USACE BIM Requirements.
- 7.2. "Model": A digital representation of physical and functional characteristics of a facility or a part thereof, comprised of "Model Elements" with "Facility/Site Data".
- 7.3. "Model Element": A self-contained element with a unique identification, whose behavior and properties are defined by Facility/Site Data and software processes. Model Elements can represent a physical entity, such as a pump or a concrete wall, and range from the simple to the complex.
- 7.4. "Facility/Site Data": The non-graphical information attached to objects in the Model that defines various characteristics of the object. Facility/Site Data can include properties such as parametric values that drive physical sizes, material definitions and characteristics (e.g. wood, metal), manufacturer data, industry standards (e.g. AISC steel properties), and project identification numbers. Facility/Site Data can also define supplementary physical entities that are not shown graphically in the Model, such as insulation around a duct, hardware on a door, content of conduit, or transformer properties.
- 7.5. "Workspace": A collection of content libraries and supporting files that define and embody a BIM standard. A workspace includes BIM libraries such as wall types, standard steel shapes, furniture, HVAC fittings, and sprinkler heads. It also contains sheet libraries such as print/plot configurations, font and text style libraries, and sheet borders and title blocks. The USACE has developed Workspaces specific to USACE BIM standards; these workspaces are dependent on specific versions of the BIM applications they serve. All USACE BIM Workspaces can be downloaded from the CAD/BIM Technology Center (https://cadbim.usace.army.mil). In some cases, there is a specific Workspace for a given CoS Facility Standard Design.
- 7.6. "IFC": Industry Foundation Class, a standard and file format used for the exchange of BIM data; see <a href="https://www.iai-tech.org">www.iai-tech.org</a>. Note: In the context of this attachment, IFC does not mean "Issued For Construction."

### **ATTACHMENT G** DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT

Organize electronic design submittal files in a subdirectory/file structure in accordance with the following table.

The Contractor may suggest a slightly different structure, subject to the discretion of the government.

Design Submittal Directory and Subdirectory File Arrangement.

Directory	Sub-Directory	Sub-Directory or Files	Files
Submittal/Package	Narratives	PDF file or files with updated design	
Name		narrative for each applicable design	
		discipline	
	Drawings	PDF (subdirectory)	Single PDF file with all
			applicable drawing sheets -
			bookmarked by sheet
			number and name
		BIM (subdirectory) See Attachment F.	BIM project folder (with
			files) per the USACE
			Workspace. Include an
			Excel drawing index file with
			each drawing sheet listed
			by sheet #, name and
			corresponding dgn file
			name (Final Design &
			Design Complete only)
	Design Analysis &	Individual PDF files containing design	, ,,
	Calculations	analysis and calculations for each	
		discipline applicable to the submittal	
		PDF file with Fire Protection and Life	
		Safety Code Review checklist	
	LEED	PDF file with updated Leed Check List	
		PDF file or files with LEED Templates	
		for each point with applicable	
		documentation included in each file.	
		LEED SUBMITTALS	
	Energy Analysis	PDF with baseline energy consumption	
		analysis	
		PDF with actual building energy	
		consumption analysis	
	Specifications	Single PDF file with table of contents	
		and all applicable specifications	
		sections.	
		Submittal Register (Final Design &	
		Design Complete submittal only)	
	Design Quality	PDF file or files with DQC checklist(s)	
	Control	and/or statements	
	Building	PDF file of rendering for each building	
	Rendering(s)	type included in contract (Final Design	
		& Design Complete).	

# ATTACHMENT H USACE BIM Project Execution Plan (PxP) Template Version 1.0

Section: 01 33 16

This template is a tool that is provided to assist in the development of a USACE BIM Project Execution Plan as required per contract. The template provides a standard format for organizations to establish their general means and methods for meeting the scope and deliverable requirements in Attachment F. It was adapted from the buildingSMART alliance™ (bSa) Project "BIM Project Execution Planning" as developed by The Computer Integrated Construction (CIC) Research Group of The Pennsylvania State University. The bSa project is sponsored by The Charles Pankow Foundation, Construction Industry Institute (CII), Penn State Office of Physical Plant (OPP), and The Partnership for Achieving Construction Excellence (PACE). The template can be found at the following link:

### https://mrsi.usace.army.mil/rfp/Shared%20Documents/USACE\_BIM\_PXP\_TEMPLATE\_V1.0.pdf

Please note: Instructions and examples to assist with the completion of this template are currently in grey. The text can and should be modified to suit the needs of the organization filling out the template. If modified, the format of the text should be changed to match the rest of the document. This can be completed, in most cases, by selecting the normal style in the template styles.

# SECTION 01 45 01.10 QUALITY CONTROL SYSTEM (QCS)

1	1.0	GENERAL

- 1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS
- 1.2. QCS SOFTWARE
- 1.3. SYSTEM REQUIREMENTS
- 1.4. RELATED INFORMATION
- 1.5. CONTRACT DATABASE
- 1.6. DATABASE MAINTENANCE
- 1.7. IMPLEMENTATION
- 1.8. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM
- 1.9. MONTHLY COORDINATION MEETING
- 1.10. NOTIFICATION OF NONCOMPLIANCE

## 1.0 GENERAL

Section: 01 45 01.10

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The Contractor module, user manuals, updates, and training information can be downloaded from the RMS web site. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data
- Request for Information
- Accident Reporting
- Safety Exposure Manhours

#### 1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

For ease and speed of communications, both Government and Contractor will exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

#### 1.2. OTHER FACTORS

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10, PROJECT SCHEDULE, Section 01 33 00, SUBMITTAL PROCEDURES, and Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

#### 1.3. QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

#### 1.4. SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

- (a) Hardware
- IBM-compatible PC with 1000 MHz Pentium or higher processor
- 256 MB RAM for workstation / 512+ MB RAM for server

Section: 01 45 01.10 Page 207 of 947

- 1 GB hard drive disk space for sole use by the QCS system
- Compact disk (CD) Reader, 8x speed or higher
- SVGA or higher resolution monitor (1024 x 768, 256 colors)
- Mouse or other pointing devise
- Windows compatible printer (Laser printer must have 4+ MB of RAM)
- Connection to the Internet, minimum 56K BPS

#### (b) Software

- MS Windows 2000 or higher
- MS Word 2000 or newer
- Latest version of: Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher
- Electronic mail (E-mail). MAPI compatible
- Virus protection software that is regularly upgraded with all issued manufacturer's updates

#### 1.5. RELATED INFORMATION

#### 1.5.1. QCS USER GUIDE

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

#### 1.5.2. CONTRACTOR QUALITY CONTROL (CQC) TRAINING

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

#### 1.6. CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by using the government's SFTP repository built into QCS import/export function. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

#### 1.7. DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government, e.g., daily reports, submittals, RFI's, schedule updates, payment requests, etc. shall be submitted using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, email or CD-ROM may be used instead (see Paragraph DATA SUBMISSION VIA CD-ROM). The QCS database typically shall include current data on the following items:

#### 1.7.1. ADMINISTRATION

#### 1.7.1.1. Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format.

#### 1.7.1.2. Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format.

#### 1.7.1.3. Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

All Requests For Information (RFI) shall be exchanged using the Built-in RFI generator and tracker in QCS.

#### 1.7.1.4. Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

#### 1.7.1.5. Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

#### 1.7.2. FINANCES

#### 1.7.2.1. Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the design and construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

#### 1.7.2.2. Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet prompt payment certification, and payment invoice in QCS. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment request, prompt payment certification, and payment invoice with supporting data by using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, E-mail or a CD-ROM may be used. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

#### 1.7.3. Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor

Quality Control (CQC) Plan within the time required in Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a QCS update reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

#### 1.7.3.1. Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government within 24 hours after the date covered by the report. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

#### 1.7.3.2. Deficiency Tracking

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

#### 1.7.3.3. QC Requirements

The Contractor shall develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

#### 1.7.3.4. Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

#### 1.7.3.5. Labor and Equipment Hours

The Contractor shall log labor and equipment exposure hours on a daily basis. This data will be rolled up into a monthly exposure report.

#### 1.7.3.6. Accident/Safety Tracking Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This supplemental entry is not to be considered as a substitute for completion of mandatory notification and reports, e.g., ENG Form 3394 and OSHA Form 300.

#### 1.7.3.7. Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

#### 1.7.3.8. Hazard Analysis

The Contractor shall use QCS to develop a hazard analysis for each feature of work included in its CQC Plan. The hazard analysis shall address any hazards, or potential hazards, that may be associated with the work

#### 1.7.4. Submittal Management

The Government will provide the submittal register form, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. The Contractor and Designer of Record (DOR) shall develop and maintain a complete list of all submittals, including completion of all data columns and shall manage all submittals. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. QCS and RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

#### 1.7.5. Schedule

The Contractor shall develop a design and construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

#### 1.7.5.1. Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data from RMS, and schedule data using SDEF.

#### 1.8. IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

#### 1.9. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of QCS data is by using the government's SFTP repository built into QCS export function. Other data should be submitted using E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of CD-ROM for data transfer. Data on CDs shall be exported using the QCS built-in export function. If used, CD-ROMs will be submitted in accordance with the following:

#### 1.9.1. File Medium

The Contractor shall submit required data on CD-ROMs. They shall conform to industry standards used in the United States. All data shall be provided in English.

#### 1.9.2. Disk Or Cd-Rom Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

#### 1.9.3. File Names

The files will be automatically named by the QCS software. The naming convention established by the QCS software shall not be altered in any way by the Contractor.

#### 1.10. MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions.

The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

#### 1.11. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

End of Section 01 45 01.10

### Section: 01 45 04.00 10

# SECTION 01 45 04.00 10 CONTRACTOR QUALITY CONTROL

- 1.1. REFERENCES
- 1.2. PAYMENT
- 2.0 PRODUCTS (NOT APPLICABLE)
- 3.0 EXECUTION
- 3.1. GENERAL REQUIREMENTS
- 3.2. QUALITY CONTROL PLAN
- 3.3. COORDINATION MEETING
- 3.4. QUALITY CONTROL ORGANIZATION
- 3.5. SUBMITTALS AND DELIVERABLES
- 3.6. CONTROL
- 3.7. TESTS
- 3.8. COMPLETION INSPECTION
- 3.9. DOCUMENTATION
- 3.10. NOTIFICATION OF NONCOMPLIANCE

### 1.0 GENERAL

#### 1.1. REFERENCES

Section: 01 45 04.00 10

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Refer to the latest edition, as of the date of the contract solicitation.

- ASTM INTERNATIONAL (ASTM)
- ASTM D 3740 Minimum Requirements for Agencies

Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

- ASTM E 329 Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- U.S. ARMY CORPS OF ENGINEERS (USACE)
   ER 1110-1-12 Quality Management

#### 1.2. PAYMENT

There will be no separate payment for providing and maintaining an effective Quality Control program. Include all costs associated therewith in the applicable unit prices or lump-sum prices contained in the Contract Line Item Schedule.

#### 2.0 PRODUCTS (Not Applicable)

#### 3.0 EXECUTION

#### 3.1. GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product, which complies with the contract requirements. The system shall cover all design and construction operations, both onsite and offsite, and shall be keyed to the proposed design and construction sequence. The site project superintendent is responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager at the site. responsible for the overall site activities, including but not limited to quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site. Different contractors have different names for the on-site overall project supervisor. For clarification, the term "site project superintendent" refers to the Contractor's senior site representative or "on-site manager", or other similar title, as those terms are used in contract Clause 52.236-7, "Superintendence by the Contractor" and in the Division 00 Section(s) of the solicitation for this contract or task order, or elsewhere in the contract. It does not refer to a construction superintendent, unless that person is also the Contractor's permanently assigned senior site representative in charge of all on-site activities.

#### 3.2. QUALITY CONTROL PLAN

Section: 01 45 04.00 10

Furnish for Government review, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Design and construction may begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. The Government will not permit work outside of the features of work included in an accepted interim plan to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started. Where the applicable Code issued by the International Code Council calls for an inspection by the Building Official, the Contractor shall include the inspections in the Quality Control Plan and shall perform the inspections. The Designer of Record shall develop a program for any special inspections required by the applicable International Codes and the Contractor shall perform these inspections, using qualified inspectors. Include the special inspection plan in the QC Plan.

#### 3.2.1. Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

- 3.2.1.1. A description of the quality control organization. Include a chart showing lines of authority and an acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. A CQC System Manager shall report to the project superintendent or someone higher in the contractor's organization.
- 3.2.1.2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Also include those responsible for performing and documenting the inspections required by the International Codes and the special inspection program developed by the designer of record.
- 3.2.1.3. A copy of the letter to the CQC System Manager, signed by an authorized official of the firm, which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Furnish copies of these letters.
- 3.2.1.4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect engineers (AE), offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
- 3.2.1.5. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. Use only Government approved Laboratory facilities.
- 3.2.1.6. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- 3.2.1.7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- 3.2.1.8. Reporting procedures, including proposed reporting formats.

3.2.1.9. A list of the definable features of work. A definable feature of work is a task, which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

- 3.2.1.10. A list of all inspections required by the International Codes and the special inspection program required by the code and this contract.
- 3.2.2. Additional Requirements for Design Quality Control (DQC) Plan

The following additional requirements apply to the Design Quality Control (DQC) plan:

- 3.2.2.1. The Contractor's QCP Plan shall provide and maintain a Design Quality Control (DQC) Plan as an effective quality control program which will assure that all services required by this design-build contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, competent, independent reviewers identified in the DQC Plan shall review all documents. Use personnel who were not involved in the design effort to produce the design to perform the independent technical review (ITR). The ITR is intended as a quality control check of the design. Include, at least, but not necessarily limited to, a review of the contract requirements (the accepted contract or task order proposal and amended RFP), the basis of design, design calculations, the design configuration management documentation and check the design documents for errors, omissions, and for coordination and design integration. The ITR team is not required to examine, compare or comment concerning alternate design solutions but should concentrate on ensuring that the design meets the contract requirements. Correct errors and deficiencies in the design documents prior to submitting them to the Government.
- 3.2.2.2. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists at each design phase as part of the project documentation.
- 3.2.2.3. A Design Quality Control Manager, who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated, shall implement the DQC Plan This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. Notify the Government, in writing, of the name of the individual, and the name of an alternate person assigned to the position.
- 3.2.2.4. Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. Include the DCM plan as a subset of the DQC Plan. See Section 'Design After Award'.

#### 3.2.3. Acceptance of Plan

Government acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

#### 3.2.4. Notification of Changes

After acceptance of the CQC Plan, notify the Government in writing of any proposed change. Proposed changes are subject to Government acceptance.

#### 3.3. COORDINATION MEETING

Section: 01 45 04.00 10

After the Postaward Conference, before start of design or construction, and prior to acceptance by the Government of the CQC Plan, the Contractor and the Government shall meet and discuss the Contractor's quality control system. Submit the CQC Plan for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. The Government will prepare minutes of the meeting for signature by both parties. The minutes shall become a part of the contract file. There may be occasions when either party will call for subsequent conferences to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

#### 3.4. QUALITY CONTROL ORGANIZATION

#### 3.4.1. Personnel Requirements

The requirements for the CQC organization are a CQC System Manager, a Design Quality Manager, and sufficient number of additional qualified personnel to ensure contract compliance. The CQC organization shall also include personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly furnish complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

#### 3.4.2. CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a BA/BS graduate of an ACCE accredited construction management college program. The CQC system Manager may alternately be an engineering technician with at least 2 years of college and an ICC certification as a Commercial Building Inspector (Residential Building Inspector certification will be required for Military Family Housing projects). In addition, the CQC system manager shall have a minimum of 5 years construction experience on construction similar to this contract. The CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. Assign the CQC System Manager no other duties (except may also serve as Safety and Health Officer, if qualified and if allowed by Section 00 73 00, or by Section 00 73 10 if this is a task order). Identify an alternate for the CQC System Manager in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager but the alternate may have other duties in addition to serving in a temporary capacity as the acting QC manager.

#### 3.4.3. CQC Personnel

- 3.4.3.1. In addition to CQC personnel specified elsewhere in the contract provide specialized CQC personnel to assist the CQC System Manager in accordance with paragraph titled Area Qualifications.
- 3.4.3.2. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; are not intended to be full time, but must be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or

experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan. One person may cover more than one area, provided that they are qualified to perform QC activities for the designated areas below and provided that they have adequate time to perform their duties:

- 3.4.4. Experience Matrix
- 3.4.4.1. Area Qualifications
- 3.4.4.1.1. Civil Graduate Civil Engineer or (BA/BS) graduate in construction management with 4 years experience in the type of work being performed on this project or engineering technician with 5 yrs related experience.
- 3.4.4.1.2. Mechanical Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Mechanical Inspector with 5 yrs related experience.
- 3.4.4.1.3. Electrical Graduate Electrical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Electrical Inspector with 5 yrs related experience.
- 3.4.4.1.4. Structural Graduate Structural Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or person with an ICC certification as a Reinforced Concrete Special Inspector and Structural Steel and Bolting Special Inspector (as applicable to the type of construction involved) with 5 yrs related experience.
- 3.4.4.1.5. Plumbing Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience, or person with an ICC certification as a Commercial Plumbing Inspector with 5 yrs related experience.
- 3.4.4.1.6. Concrete, Pavements and Soils Materials Technician (present while performing tests) with 2 yrs experience for the appropriate area
- 3.4.4.1.7. Testing, Adjusting and Balancing Specialist must be a member (TAB) Personnel of AABC or an experienced technician of the firm certified by the NEBB (present while testing, adjusting, balancing).
- 3.4.4.1.8. Design Quality Control Manager Registered Architect or Professional Engineer (not required on the construction site)
- 3.4.4.1.9. Registered Fire Protection Engineer with 4 years related experience or engineering technician with 5 yrs related experience (but see requirements for Fire Protection Engineer of Record to witness final testing in Section 01 10 00, paragraph 5.10, Fire Protection).
- 3.4.4.1.10. QC personnel assigned to the installation of the telecommunication system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification. In lieu of BICSI certification, QC personnel shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. QC personnel shall witness and certify the testing of telecommunications cabling and equipment.
- 3.4.5. Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractors". This course is periodically offered at [Not Supplied - ConstructionReqQC : COURSE\_LOCATION]. Inquire of the District or Division sponsoring the course for fees and other expenses involved, if any, for attendance at this course.

#### 3.4.6. Organizational Changes

When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

#### 3.5. SUBMITTALS AND DELIVERABLES

Make submittals as specified in Section 01 33 00 **SUBMITTAL PROCEDURES**. The CQC organization shall certify that all submittals and deliverables are in compliance with the contract requirements.

#### 3.6. CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. The CQC organization shall conduct at least three phases of control for each definable feature of the construction work as follows:

#### 3.6.1. Preparatory Phase

Perform this phase prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- 3.6.1.1. A review of each paragraph of applicable specifications, reference codes, and standards. Make a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field at the preparatory inspection. Maintain these copies in the field, available for use by Government personnel until final acceptance of the work.
- 3.6.1.2. A review of the contract drawings.
- 3.6.1.3. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- 3.6.1.4. Review of provisions that have been made to provide required control inspection and testing.
- 3.6.1.5. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- 3.6.1.6. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- 3.6.1.7. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- 3.6.1.8. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- 3.6.1.9. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

- 3.6.1.10. Discussion of the initial control phase.
- 3.6.1.11. Notify the Government at least 24 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

#### 3.6.2. Initial Phase

Accomplish this phase at the beginning of a definable feature of work. Include the following actions:

- 3.6.2.1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- 3.6.2.2. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- 3.6.2.3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- 3.6.2.4. Resolve all differences.
- 3.6.2.5. Check safety to include compliance with and upgrading of the Accident Prevention plan and activity hazard analysis. Review the activity analysis with each worker.
- 3.6.2.6. Notify the Government at least 24 hours in advance of beginning the initial phase. The CQC System Manager shall prepare and attach to the daily CQC report separate minutes of this phase. Indicate exact location of initial phase for future reference and comparison with follow-up phases.
- 3.6.2.7. Repeat the initial phase any time acceptable specified quality standards are not being met.

#### 3.6.3. Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Conduct final follow-up checks and correct deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

#### 3.6.4. Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

#### 3.7. TESTS

#### 3.7.1. Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements and project design documents. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing

includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory, or establish an approved testing laboratory at the project site. The Contractor may elect to use a laboratory certified and accredited by the Concrete and cement Reference Laboratory (CCRL) or by AASHTO Materials Reference Laboratory (AMRL) for testing procedures that those organizations certify. The Contractor shall perform the following activities and record and provide the following data:

- 3.7.1.1. Verify that testing procedures comply with contract requirements and project design documents.
- 3.7.1.2. Verify that facilities and testing equipment are available and comply with testing standards.
- 3.7.1.3. Check test instrument calibration data against certified standards.
- 3.7.1.4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- 3.7.1.5. Include results of all tests taken, both passing and failing tests, recorded on the CQC report for the date taken. Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.
- 3.7.2. Testing Laboratories

#### 3.7.2.1. Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

#### 3.7.2.2. Capability Recheck

If the selected laboratory fails the capability check, the Government will assess the Contractor a charge of \$1,375 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

#### 3.7.3. Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4. Furnishing or Transportation of Samples for Government Quality Assurance Testing

The Contractor is responsible for costs incidental to the transportation of samples or materials. Deliver samples of materials for test verification and acceptance testing by the Government to the Corps of Engineers Laboratory, f.o.b., at the following address:

For delivery by mail:

[Not Supplied - ConstructionReqQC : LAB\_NAME] [Not Supplied - ConstructionReqQC : LAB\_ATTN]

[Not Supplied - ConstructionReqQC : LAB\_MAIL]

[Not Supplied - ConstructionReqQC : LAB STATE]

For other deliveries:

[Not Supplied - ConstructionReqQC : LAB\_NAME\_OTHER]

[Not Supplied - ConstructionRegQC : LAB ATTN OTHER]

[Not Supplied - ConstructionReqQC : LAB\_MAIL\_OTHER]

[Not Supplied - ConstructionRegQC : LAB STATE OTHER]

The area or resident office will coordinate, exact delivery location, and dates for each specific test.

#### 3.8. COMPLETION INSPECTION

#### 3.8.1. Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. Prepare a punch list of items which do not conform to the approved drawings and specifications and include in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

#### 3.8.2. Pre-Final Inspection

As soon as practicable after the notification above, the Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. Accomplish these inspections and any deficiency corrections required by this paragraph within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

#### 3.8.3. Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall attend the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups and major commands may also attend. The Government will formally schedule the final acceptance inspection based upon results of the Pre-Final inspection. Provide notice to the Government at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

#### 3.9. DOCUMENTATION

3.9.1. Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers using

government-provided software, QCS (see Section 01 45 01.10). The report includes, as a minimum, the following information:

- 3.9.1.1. Contractor/subcontractor and their area of responsibility.
- 3.9.1.2. Operating plant/equipment with hours worked, idle, or down for repair.
- 3.9.1.3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- 3.9.1.4. Test and/or control activities performed with results and references to specifications/drawings requirements. Identify the applicable control phase (Preparatory, Initial, Follow-up). List deficiencies noted, along with corrective action.
- 3.9.1.5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- 3.9.1.6. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
- 3.9.1.7. Offsite surveillance activities, including actions taken.
- 3.9.1.8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- 3.9.1.9. Instructions given/received and conflicts in plans and/or specifications.
- 3.9.1.10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identity of the ITR team, the ITR review comments, responses and the record of resolution of the comments.
- 3.9.2. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, submit one report for every 7 days of no work and on the last day of a no work period. Account for all calendar days throughout the life of the contract. The first report following a day of no work shall be for that day only. The CQC System Manager shall sign and date reports. The report shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel. The Contractor may submit these forms electronically, in lieu of hard copy.

#### 3.10. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

End of Section 01 45 04.00 10

# SECTION 01 50 02 TEMPORARY CONSTRUCTION FACILITIES

#### 1.0 OVERVIEW

- 1.1. GENERAL REQUIREMENTS
- 1.2. AVAILABILITY AND USE OF UTILITY SERVICES
- 1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN
- 1.4. PROTECTION AND MAINTENANCE OF TRAFFIC
- 1.5. MAINTENANCE OF CONSTRUCTION SITE
- 1.6. GOVERNMENT FIELD OFFICE

**OVERVIEW** 

1.0

Section: 01 50 02

#### 1.1. GENERAL REQUIREMENTS

#### 1.1.1. Site Plan

Prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Also indicate if the use of a supplemental or other staging area is desired.

#### 1.2. AVAILABILITY AND USE OF UTILITY SERVICES.

1.2.1. See Section 00 72 00, Contract Clauses and Section 00 73 00, Special Contract Requirements, for Utility Availability requirements.

#### 1.2.2. Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

#### 1.2.3. Telephone

Make arrangements and pay all costs for desired telephone facilities.

#### 1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

#### 1.3.1. Bulletin Board

Immediately upon beginning of onsite work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Display legible copies of the aforementioned data until work is completed. Remove the bulletin board from the site upon completion of the project.

#### 1.3.2. Project and Safety Signs

Erect a project sign and a site safety sign with informational details as provided by the Government at the Post award conference, within 15 days prior to any work activity on project site. Update the safety sign data daily, with light colored metallic or non-metallic numerals. Remove the signs from the site upon completion of the project. Engineer Pamphlet EP 310-1-6a contains the standardized layout and construction details for the signs. It can be found through a GOOGLE Search or try the US Army Corps of Engineers Techinfo Website at <a href="http://www.hnd.usace.army.mil/techinfo/">http://www.hnd.usace.army.mil/techinfo/</a>. Click on Publications then go to Engineer Pamphlets and select EP 310-1-6a.

#### 1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

Provide access and temporary relocated roads as necessary to maintain traffic. Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Take measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property.

The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little

as possible with public traffic. Investigate the adequacy of existing roads and the allowable load limit on these roads. Repair any damage to roads caused by construction operations.

#### 1.4.1. Haul Roads

Section: 01 50 02

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Construct haul roads with suitable grades and widths. Avoid sharp curves, blind corners, and dangerous cross traffic. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Provide adequate lighting to assure full and clear visibility for full width of haul road and work areas during any night work operations. Remove haul roads designated by the Contracting Officer upon completion of the work and restore those areas.

#### 1.4.2. Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

#### 1.5. MAINTENANCE OF CONSTRUCTION SITE

Mow grass and vegetation located within the boundaries of the construction site for the duration of the project, from NTP to contract completion. Edge or neatly trim grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers from NTP to contract completion.

#### 1.6. GOVERNMENT FIELD OFFICE

#### 1.6.1. Resident Engineer's Office

Provide the Government Resident Engineer with an office, approximately 200 square feet in floor area, co-located on the project site with the Contractor's office and providing space heat, air conditioning, electric light and power, power and communications outlets and toilet facilities consisting of at least one lavatory and at least one water closet complete with connections to water and sewer mains. Provide a mail slot in the door or a lockable mail box mounted on the surface of the door. Provide outlets for 4 government phones and same number of LAN connections for Government computers. Coordinate with the Resident Engineer for locations. Provide a conference room with space large enough for 12 personnel to hold meetings. Provide a minimum of two outlets per government work station and at least one outlet per 10 feet of wall space for other government equipment. Provide at least twice weekly janitorial service. Remove the office facilities upon completion of the work and restore those areas. Connect and disconnect utilities in accordance with local codes and to the satisfaction of the Contracting Officer.

#### 1.6.2. Trailer-Type Mobile Office

The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above Securely anchor the trailer to the ground at all four corners to guard against movement during high winds, per EM 385-1-1.

End of Section 01 50 02

## SECTION 01 57 20.00 10 ENVIRONMENTAL PROTECTION

10 GENERAL REQUIREMENTS			
	1 0	CENEDAL	DECHIDEMENTS

- 1.1. SUBCONTRACTORS
- 1.2. ENVIRONMENTAL PROTECTION PLAN
- 1.3. PROTECTION FEATURES
- 1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS
- 1.5. NOTIFICATION
- 2.0 PRODUCTS (NOT USED)
- 3.0 EXECUTION
- 3.1. LAND RESOURCES
- 3.2. WATER RESOURCES
- 3.3. AIR RESOURCES
- 3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL
- 3.5. RECYCLING AND WASTE MINIMIZATION
- 3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES
- 3.7. BIOLOGICAL RESOURCES
- 3.8. INTEGRATED PEST MANAGEMENT
- 3.9. PREVIOUSLY USED EQUIPMENT
- 3.10. MILITARY MUNITIONS
- 3.11. TRAINING OF CONTRACTOR PERSONNEL
- 3.12. POST CONSTRUCTION CLEANUP

#### 1.0 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this contract. Comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations

#### 1.1. SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

#### 1.2. ENVIRONMENTAL PROTECTION PLAN

1.2.1. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Define issues of concern within the Environmental Protection Plan as outlined in this section. Address each topic in the plan at a level of detail commensurate with the environmental issue and required construction task(s). Identify and discuss topics or issues which are not identified in this section, but which the Contractor considers necessary, after those items formally identified in this section. Prior to commencing construction activities or delivery of materials to the site, submit the Plan for review and Government approval. The Contractor shall meet with the Government prior to implementation of the Environmental Protection Plan, for the purpose of discussing the implementation of the initial plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. Maintain and keep the Environmental Protection Plan current onsite.

#### 1.2.2. Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

#### 1.2.3. Contents

The plan shall include, but shall not be limited to, the following:

- 1.2.3.1. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.
- 1.2.3.2. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable
- $1.2.3.3.\ Name(s)\ and\ qualifications\ of\ person(s)\ responsible\ for\ training\ the\ Contractor's\ environmental\ protection\ personnel$
- 1.2.3.4. Description of the Contractor's environmental protection personnel training program
- 1.2.3.5. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. Include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

- 1.2.3.6. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site
- 1.2.3.7. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.
- 1.2.3.8. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.
- 1.2.3.9. Drawing showing the location of on-installation borrow areas.
- 1.2.3.10. A spill control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The spill control plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:
- (a) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Government and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.
- (b) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup
- (c) Training requirements for Contractor's personnel and methods of accomplishing the training
- (d) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
- (e) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency
- (f) The methods and procedures to be used for expeditious contaminant cleanup
- A solid waste management plan identifying waste minimization, collection, and disposals methods, waste streams (type and quantity), and locations for solid waste diversion/disposal including clearing debris and C&D waste that is diverted (salvaged, reused, or recycled). Detail the contractor's actions to comply with, and to participate in, Federal, state, regional, local government, and installation sponsored recycling programs to reduce the volume of solid waste at the source. Identify any subcontractors responsible for the transportation, salvage and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility. Attach evidence of the facility's ability to accept the solid waste to this plan. A construction and demolition waste management plan, similar to the plan specified in the UFGS 01 74 19 (formerly 01572) may be used as the nonhazardous solid waste management plan. Provide a Non-Hazardous Solid Waste Diversion Report. Submit the report on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and each quarter thereafter (e.g. the first working day of January, April, July, and October) until the end of the project. Additionally, a summary report, with all data fields, is required at the end of the project. The report shall indicate the total type and amount of waste generated, total type and amount of waste diverted, type and amount of waste sent to waste-to-energy facility and alternative daily cover, in tons along with the percent that was diverted. Maintain, track and report construction and demolition waste data in a manner such that the installation can enter the data into the Army SWAR database, which separates data by type of material. A cumulative report in LEED Letter Template format may be used but must be modified to include the date disposed of/diverted and include

Section: 01 57 20.00 10 W912QR-23413770 CERTIFIED FINAL-003
Page 231 of 947

the above stated diversion data. NOTE: The Solid Waste Diversion Reports are separate documentation than the LEED documentation.

#### 1.2.3.12. DELETED.

- 1.2.3.13. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.
- 1.2.3.14. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of these materials. In accordance with EM 385-1-1, include a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time in the contaminant prevention plan. Update the plan as new hazardous materials are brought on site or removed from the site. Reference this plan in the storm water pollution prevention plan, as applicable.
- 1.2.3.15. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented and any required permits. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, include documentation that the waste water treatment plant Operator has approved the flow rate, volume, and type of discharge.
- 1.2.3.16. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. Include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Government.
- 1.2.3.17. A pesticide treatment plan, updated, as information becomes available. Include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional Installation specific requirements. Follow AR 200-1, Chapter 5, Pest Management, Section 5-4, "Program Requirements" for data required to be reported to the Installation.

#### 1.3. PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Government shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. Both the Contractor and the Government will

sign this survey, upon mutual agreement as to its accuracy and completeness. The Contractor develop a plan that depicts how it will protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

#### 1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Government and may require an extended review, processing, and approval time. The Government reserves the right to disapprove alternate methods, even if they are more cost effective, if the Government determines that the proposed alternate method will have an adverse environmental impact.

#### 1.5. NOTIFICATION

The Government will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Government of the proposed corrective action and take such action when approved by the Government. The Government may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Government may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

#### 2.0 PRODUCTS (NOT USED)

#### 3.0 EXECUTION

#### 3.1. LAND RESOURCES

Confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. Do not attach or fasten any ropes, cables, or guys to any trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Remove all stone, soil, or other materials displaced into uncleared areas..

#### 3.1.1. Work Area Limits

Prior to commencing construction activities, mark the areas that need not be disturbed under this contract. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. Personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

#### 3.1.2. Landscape

Clearly identify trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved by marking, fencing, or wrapping with boards, or any other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

#### 3.1.3. Erosion and Sediment Controls

Provide erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. Coordinate with approving authorities (federal, state, etc.) for specific requirements to be included in the plan. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. Keep the area of bare soil exposed at any one time by construction operations to a minimum necessary. Construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Remove any temporary measures after the area has been stabilized.

#### 3.1.4. Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Government. Make only approved temporary movement or relocation of Contractor facilities. Provide erosion and sediment controls for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant and/or work areas to protect adjacent areas.

#### 3.2. WATER RESOURCES

Monitor construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated. Monitor all water areas affected by construction activities. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by state or federally issued Clean Water Act permits.

#### 3.2.1. Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments or impede state-designated flows.

#### 3.2.2. Wetlands

Do not enter, disturb, destroy, or allow discharge of contaminants into any wetlands.

#### 3.3. AIR RESOURCES

Comply with all Federal and State air emission and performance laws and standards for equipment operation, activities, or processes.

#### 3.3.1. Particulates

Control dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants, including weekends, holidays and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods are permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with all State and local visibility regulations.

#### 3.3.2. Odors

Control odors from construction activities at all times. Odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

#### 3.3.3. Sound Intrusions

Section: 01 57 20.00 10

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the state and Installation rules.

#### 3.3.4. Burning

Burning is not allowed on the project site unless specified in other sections of the specifications or by written authorization. Specific times, locations, and manners of burning shall be subject to approval.

#### 3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

#### 3.4.1. Solid Wastes

Place solid wastes (excluding clearing debris) in containers which are emptied on a regular schedule. Conduct handling, storage, and disposal to prevent contamination. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with solid waste. Transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The minimum acceptable off-site solid waste disposal option is a Subtitle D RCRA permitted landfill. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

#### 3.4.2. Chemicals and Chemical Wastes

Dispense chemicals, ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. The Government may periodically review this documentation. Collect chemical waste in corrosion resistant, compatible containers. Monitor and remove collection drums to a staging or storage area when contents are within 6 inches of the top. Classify, manage, store, and dispose of wastes in accordance with Federal, State, and local laws and regulations.

#### 3.4.3. Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable state and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. At a minimum, manage and store hazardous waste in compliance with 40 CFR 262. Take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. Segregate hazardous waste from other materials and wastes; protect it from the weather by placing it in a safe covered location and take precautionary measures, such as berming or other appropriate measures, against accidental spillage. Store, describe, package, label, mark, and placard hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, state, and local laws and regulations. Transport Contractor generated hazardous waste off Government property in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. Dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Immediately report spills of hazardous or toxic materials to the Government and the Facility Environmental Office. Contractor will be responsible for cleanup and cleanup costs due to spills.

Contractor is responsible for the disposition of Contractor generated hazardous waste and excess hazardous materials.

#### 3.4.4. Fuel and Lubricants

Conduct storage, fueling and lubrication of equipment and motor vehicles in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations.

#### 3.5. RECYCLING AND WASTE MINIMIZATION

Participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project. Line and berm fueling areas and establish storm water control structures at discharge points for site run-off. Keep a liquid containment clean-up kit available at the fueling area.

#### 3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Existing historical, archaeological, and cultural resources within the Contractor's work area are shown on the drawings. Protect and preserve these resources during the life of the Contract. Temporarily suspend all activities that may damage or alter such resources, if any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found during excavation or other construction activities. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, notify the Government so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

#### 3.7. BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitat. Protect threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

#### 3.8. INTEGRATED PEST MANAGEMENT

Coordinate, through the Government, with the Installation Pest Management Coordinator (IPMC) at the earliest possible time prior to pesticide application, in order to minimize impacts to existing fauna and flora. Discuss integrated pest management strategies with the IPMC and receive concurrence from the IPMC, through the COR, prior to the application of any pesticide associated with these specifications. Give IMPC personnel the opportunity to be present at all meetings concerning treatment measures for pest or disease control and during application of the pesticide. The use and management of pesticides are regulated under 40 CFR 152 - 186.

#### 3.8.1. Pesticide Delivery and Storage

Deliver pesticides, approved for use on the Installation, to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

#### 3.8.2. Qualifications

Use the services of a subcontractor for pesticide application whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed.

#### 3.8.3. Pesticide Handling Requirements

Formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions.

#### 3.8.4. Application

A state certified pesticide applicator shall apply pesticides in accordance with EPA label restrictions and recommendations.

#### 3.9. PREVIOUSLY USED EQUIPMENT

Clean all previously used construction equipment prior to bringing it onto the project site. Ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the USDA jurisdictional office for additional cleaning requirements.

#### 3.10. MILITARY MUNITIONS

Immediately stop work in that area and immediately inform the Government, in the event military munitions, as defined in 40 CFR 260, are discovered or uncovered.

#### 3.11. TRAINING OF CONTRACTOR PERSONNEL

Train personnel in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. The training and meeting agenda shall include methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

#### 3.12. POST CONSTRUCTION CLEANUP

Clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade, fill and seed the entire disturbed area, unless otherwise indicated.

## **ATTACHMENT 4**

# Storm Water Pollution Prevention Plan 5 Acres or Less

Fort Campbell, Kentucky

Storm Water Pollution Prevention Plan For Construction Sites that Disturb Five Acres of Land or Less

For construction activities associated with

Thursday, February 07, 2013

Section: 0	1 57	23
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Project 1	Number
From (Date)	through (Date)

Note: This Storm Water Pollution Prevention Plan was developed using the Fort Campbell SWPPP baseline template for construction sites that disturb <u>five acres of land or less</u>.

# Fort Campbell, Kentucky Storm Water Pollution Prevention Plan For Construction Sites that Disturb Five Acres of Land or Less

#### **Table of Contents**

Section Page Number\*

- 1. Contractor's Form and Certification
- 2. Authorization, Purpose and Objectives
- 3. Sediment and Erosion Controls
- 4. Other Items Requiring Control
- 5. Storm Water Management
- \* Page numbers have been intentionally omitted until added by electronic requirements to post to the WEB. There are 37 pages (from the title page to the last page) included within this document.

#### **Appendices**

Appendix A – Site Location Map

Appendix B – Existing and Proposed Conditions

Appendix C – Sediment and Erosion Control Plan

Appendix D – Specifications, BMPs and Typical Drawings

Appendix E – Construction Storm Water Inspection Report Form

#### **Section 1**

# FORT CAMPBELL, KENTUCKY STORM WATER SEDIMENT AND EROSION CONTROL INFORMATION FORM FOR CONSTRUCTION SITES THAT DISTURB <u>5 ACRES OR LESS</u> OF LAND/SOIL

	Notice of Coverage (NOC) Date				
State County					
Project No.	Contract No				
Name of Project					
Project Location (latitude)	(longitude)				
Project Location (Address)					
Project Description					
Activities (acres)	ted to be Disturbed by Excavation, Grading or Other e to this Project (acres)				
Runoff from this Site	S "blue line" Stream which will Receive Storm Water  Anticipated to be Present at this Construction Site Include				
Runoff from this Site.  Construction Materials that are  Other Materials (such as fertiliz are anticipated to be present at t	Anticipated to be Present at this Construction Site Include ters, lime, diesel, gasoline, machinery lubricants, etc.) that this construction site shall be listed on a separate documente Fort Campbell Site Specific Spill Plan.				
Construction Materials that are  Other Materials (such as fertiliz are anticipated to be present at t by the Contractor as a part of th	Anticipated to be Present at this Construction Site Include ters, lime, diesel, gasoline, machinery lubricants, etc.) that this construction site shall be listed on a separate documente Fort Campbell Site Specific Spill Plan.				
Construction Materials that are  Other Materials (such as fertiliz are anticipated to be present at t by the Contractor as a part of th Name of Storm Water Inspector	Anticipated to be Present at this Construction Site Include ters, lime, diesel, gasoline, machinery lubricants, etc.) that this construction site shall be listed on a separate documente Fort Campbell Site Specific Spill Plan.				
Construction Materials that are  Other Materials (such as fertiliz are anticipated to be present at t by the Contractor as a part of th Name of Storm Water Inspecto  Developer and/or Contractor  Name	Anticipated to be Present at this Construction Site Include ters, lime, diesel, gasoline, machinery lubricants, etc.) that this construction site shall be listed on a separate documente Fort Campbell Site Specific Spill Plan.				

# **Contractor's Certification**

I certify under penalty of law that this contractor's form and all required contractor's attachments were prepared under my direction or supervision in accordance with a system designated to assure that qualified personnel properly gathered, evaluated and developed the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for developing the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there may be penalties for submitting false information.

Printed Name		
Title		
Signature		
Date	 	

Section: 01 57 23

#### **Section 2**

#### **Purpose and Objectives**

#### 2.1 Purpose

This document is intended to be used as the Storm Water Pollution Prevention Plan (SWPPP) and shall be kept on the construction site or readily available for inspection. Each construction site shall require a site specific drawing and map from the contractor, as defined in Appendix C, and included with this plan for erosion and sediment control as needed for proper management. This plan is intended to comply with Federal, State, local, and Fort Campbell, KY regulations in the management of storm water erosion and sediment for construction sites that disturb five (5) acres or less. All sites are subject to inspections by Federal, State, local, and Fort Campbell agencies. This plan when submitted and used is intended for the contractor to ensure the controls used will meet the objectives. Compliance shall be verified through visual inspection after rain events, twice a week inspections, and other inspections and assessments as required. The plan shall be discussed at all preconstruction meetings.

#### 2.2 Objectives

- 1. To protect human life and health.
- 2. To comply with Tennessee, Kentucky, and EPA regulations.
- 3. To protect water resources quantity and quality and prevent degradation of these resources
- 4. To protect and enhance storm water quality at the level of designated use.
- 5. To control erosion and sediment runoff.
- 6. To maintain and protect the natural, physical, and biological characteristics and functions (e.g., no significant changes in the hydrological regime or pollutant input) of the receiving water.

#### **Section 3**

#### **Erosion and Sediment Control**

#### 3.1 General Requirements

- 1. Each individual project shall implement sediment and erosion control measures to prevent sediment from leaving the construction site.
- 2. No construction shall be performed in a manner that will negatively impact the storm water quantity or quality of any wet weather conveyance of Fort Campbell.
- 3. All development shall be conducted in a manner which minimizes soil erosion and resulting sedimentation. Under no circumstances is construction to allow sediment to leave a construction site in a way that would be a violation of state regulations. Site specific variables such as topography, soil erodibility, storm water management features, and vegetation shall be considered when implementing sediment and erosion control measures. The exposed area of any disturbed land shall be limited to the smallest practical area for the shortest possible period of time. A rain gauge is recommended to record rainfall events at the site, or use a representative reference site for a record of daily amount of precipitation.
- 4. Contractor is **required** to have a person qualified to perform erosion prevention and sediment control inspections. The qualified individual should have current certification through the Tennessee Erosion Prevention and Sediment Control and Certification Program Course, or be able to provide documentation of equal qualification. Certification shall be included as a deliverable to the contracting agency before contract award. TDEC course information can be found and is offered through Tennessee Department of Environmental and Conservation Web site:

  <a href="http://www.state.tn.us/environment/wpc/wpcppo/training/">http://www.state.tn.us/environment/wpc/wpcppo/training/</a>
- 5. A professional engineer licensed in the state of KY and/or TN qualified by education and experience to perform the necessary hydrologic and hydraulic calculation shall be used for the design or approve the design of a permanent or temporary basin, if required.

#### 3.2 Design Hydrology

Erosion and sediment controls shall be designed to control runoff from a design storm of 4.5 inches of rainfall within a 24-hour time period.

#### 3.3 Pre-Construction

No land/soil disturbing activity may begin until the following conditions have been met:

- Erosion and sediment controls are in place and functional.
- Storm Water Inspection Program and qualified person are in place.
- Site specific Storm Water Pollution Prevention Plan for a 5-year 24-hour storm event (4.5 inches of rain/24hours) is complete and is on site or readily available.
- State Permit NOI is properly filled out, signed by the primary contractor and displayed on site or available when requested.

Pre-construction vegetative groundcover will not be destroyed, removed, or disturbed more than 20 calendar days prior to grading or earthmoving unless temporary cover is installed (i.e. seeding and mulching).

Other temporary controls can be installed or adequate BMPs can be implemented to retain sediment on site. Temporary erosion control measures may be removed at the beginning of the workday, but shall be replaced at the end of the day.

Structural measures for this phase of construction may include temporary silt fencing, filter barriers, hay bales, dumped rock, etc.

Twice-a-week and after rain event inspections are performed to ensure proper storm water release.

#### 3.4 Erosion & Sediment Control

Storm water runoff controls for the proposed project will consist of the structural control measures themselves and the maintenance and inspection practices discussed in this Plan. They shall be designed to retain sediment on the project site. The Contractor will be responsible for the implementation and execution of all storm water runoff controls.

Erosion and sediment control measures shall be appropriate for the actual site conditions. In addition, the appropriate schedule of implementation shall be the contractor's responsibility. Particular attention is required for concentrated storm water flows. Either concentrated storm water flows shall be avoided or the conveyance system shall be protected sufficiently to prevent significant erosion. Sediment trapping devices are required at all points where storm water leaves a site laden with sediment. Erosion and sediment measures include but are not limited to the following:

- 1. Erosion prevention on denuded areas
- 2. Non-structural management practices to be implemented
- 3. Perimeter controls
- 4. Permanent storm water conveyance structures
- 5. Final stabilized conditions of the site
- 6. Provision for removing temporary control measures
- 7. Stabilization of the site where temporary measures are removed
- 8. Maintenance requirements for temporary management practices
- 9. Maintenance requirements for any permanent measures
- 10. Storm water inlets shall be protected to ensure only storm water enters.
- 11. Land/soil disturbed areas shall be mulched/stabilized as needed to prevent erosion and sediment loss.

#### Construction Entrance(s)

Entry and exit roads at the construction site shall be protected to control sediment from leaving the site. Contractor shall utilize Number 1 to Number 3 size stone, at least 6-inches thick and 50-feet long. Exceptions to the 50-foot length requirement may be alloyed by the contracting agency depending on the size of construction site. Permanent stabilization methods for entry and exit roads are required. Street sweeping may be required to clean up sediment and/or any soils that accumulate at entry and exit roads locations.

### Adjacent Roadways

Section: 01 57 23

The contractor shall establish and maintain a proactive method to prevent the off-site migration or deposit of sediment on roadways used by the general public.

#### Utility Installation and Construction

Utility installation/construction projects shall compact, shape, and apply permanent stabilization to the disturbed soil within 7 working days of completed linear section. Completed linear section of utility is achieved when the utility has been installed and covered with soil. Erosion and sediment controls will be implemented as necessary during utility installation/construction to ensure sediment does not leave the site.

#### Clearing and Grubbing

Clearing, grubbing and other disturbances to riparian vegetation shall be limited to the minimum necessary for grading, slope construction and equipment operation. Unnecessary vegetation removal is prohibited. Construction shall be sequenced to minimize exposure time of denuded areas, and all disturbed areas shall be properly stabilized as soon as possible.

Stabilization practices for this phase of construction consist mainly of temporary seeding and mulching of areas that have been cleared on which earth-disturbing activities will not resume within fifteen days.

Structural measures for this phase of construction include temporary silt fencing, filter barriers, hay bales, etc., as shown on the typical drawings presented in Appendix D.

#### Sinkhole and Drainage Well Information

Sinkholes must be protected from soil, sediment, or any pollutant entering them. Contractor shall immediately notify DPW Engineering and/or DPW Environmental should a sinkhole be found during construction. Do not fill any sinkhole without written approval from Fort Campbell DPW Environmental Division.

#### Construction on Stream Banks and in Streams

Construction on stream banks and in streams is not authorized or allowed without special permits or prior written approval from DPW or the contracting agency. Contractor shall contact the DPW Environmental Division, Conservation Branch to determine and obtain the proper permits. Reference:

40 CFR 301-303, 306,307

TN: Aquatic Resource Alteration Permit, TN Rule 1200-4, ARAP 401, 404

KY: KAR 401 Water Quality Certification

Soil materials must be prevented from entering waters of the State. Erosion and sedimentation control measures to protect water quality must be maintained throughout the construction period. Structural measures for this phase include detention basins, silt fencing and hay bales. Hay bales and/or silt fencing must be installed along the base of all fills and cuts, on the down gradient side of stockpiled soil, and along stream banks in cleared areas to prevent sediment migration into

streams. They must be installed on the contour, entrenched and staked, and extending the full width of the area to be cleared. See typical drawings presented in Appendix D for construction details.

Storm water must be held in settling basins until at least as clear as the receiving waters. Settling basins shall not be located closer than 20 feet from the top bank of a stream (or 60-feet from the top bank of an impaired or high quality stream). Settling basins and traps shall be properly designed according to the size of the drainage areas or volume of water to be treated.

#### Discharges into Impaired or High Quality Streams

Discharges into impaired or high quality streams will require additional erosion and sediment controls. Construction activities near or adjacent to an impaired or high quality stream will require protection of a minimum of 60-foot natural riparian buffer zone between the stream and the disturbed construction area. In addition, for an outfall in a drainage area of a total of 5 or more acres, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 5-year, 24-hour storm and runoff from each acre drained, or equivalent control measures, shall be provided until final stabilization of the site.

#### Off-site Storm Water

All surface water flowing toward the excavation or fill work shall be diverted through utilization of berms, flumes, diversion channels with sand bag berms, diversion pipes, or in some cases cofferdams. Temporary diversion channels must be protected by non-erodible material.

#### **Grading and Excavation**

Permanent or temporary soil stabilization shall be applied as soon as possible but in no case later than 7 days after final grade is reached on any portion of the site except as follows:

- Where stabilization measures by the seventh day are precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as possible.
- Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 15 days, temporary stabilization measures do not have to be initiated on that portion of the site.

The site is required to retain sediment through other BMPs when these soil conditions exist until permanent or temporary soil stabilization can be implemented.

Temporary or permanent soil stabilization shall be accomplished within 15 days after final grading or other earthwork. Permanent stabilization with perennial vegetation (using native herbaceous and woody plants where practicable) or other permanently stable, non-eroding surface shall replace any temporary measures as soon as practicable.

Soil stabilization refers to measures that protect soil from the erosive forces of raindrop impact and flowing water. Applicable practices include but are not limited to temporary or permanent vegetative establishment, mulching, sod application, vegetative buffers, rock buffers, and the early application of gravel base on areas to be paved. Selected soil stabilization measures shall be appropriate for the time of year, site conditions, and estimated duration of use.

Soil stockpiles shall be stabilized if left undisturbed for 7 or more days. Stabilization measures shall include but are not limited to: covering the stockpile with erosion control mat, tarp or plastic, or temporary seed cover and straw the stockpile. Soil stockpiles shall be protected with sediment trapping measures that may include sediment traps or detention ponds to prevent soil loss from the project site throughout the life of the soil stockpiling practice.

Stabilization practices for this phase of construction consist mainly of temporary seeding and mulching of areas that have been cleared on which earth-disturbing activities will not resume within fifteen days.

Structural measures for this phase include installing hay bales, silt fence and filter barriers along the base of all cuts and fills.

#### Seeding and Sodding

A permanent vegetative cover shall be established on all denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved which shall be stabilized to 95% with established permanent vegetation or sod. This process in part is needed to permanently control erosion and sediment from leaving the site after construction is complete and allows DPW Environmental Division/Contracting Agency to perform state required Notice of Termination (NOT) for the site.

#### Final Stabilization

All permanent structural practices will have been completed at this phase of the project. After final stabilization has been achieved, all silt fencing and temporary slope drains will be removed to prevent it from becoming a pollutant, and properly disposed.

#### **Section 4**

#### **Other Items Requiring Control**

#### **4.1 Construction Materials**

Construction materials that are anticipated to be present at this construction site shall be identified on the Contractor's Form (Section 1). Areas designated for storage of the materials shall be identified on the site drawing included in Appendix C.

Stockpiled erodable construction materials will be secured by control measures down gradient of the stockpiles. Non-erodable materials will be picked up to prevent them from polluting storm water.

#### 4.2 Waste Materials

Waste material (earth and rock) not required for the construction of the project shall not be stockpiled on-site. The contractor shall not dispose of any material in a regulatory floodway, sinkhole, wetland or any area that shall cause impairment of any waters of Fort Campbell.

Borrow and waste disposal areas shall be located in upland (non-wetland) areas and above the 100-year Federal Emergency Management Agency floodplain. Borrow and waste disposal areas shall not affect any waters of the State/U.S./Fort Campbell and shall be above ordinary high water of any adjacent watercourse.

#### 4.3 Other Materials

The Contractor shall take appropriate steps to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the State/U.S. All equipment refueling, servicing, and staging areas shall comply with all local, state, and federal laws, rules, regulations, and ordinances; including those of the National Fire Protection Association (NFPA). Appropriate containment measures for these areas shall be utilized. All spills must be reported immediately to the Fort Campbell Directorate of Public Works, and measures shall be taken immediately to prevent the pollution of waters of the State/U.S., including groundwater, should a spill occur.

Soils at fueling stations should be checked daily for signs of spillage or staining of the soil. Any fixed fueling station/tank storage shall have a containment system to prevent runoff by potential spills or tank rupture. Machinery should be serviced or repaired to prevent leaks of fluids from construction machinery.

The Contractor will be responsible for compliance with all applicable EPA guidelines regarding equipment related fluids as well as all National Fire Protection Association regulations regarding flammable liquids.

#### 4.4 Non-Storm Water Discharges

Section: 01 57 23

The following non-storm water discharges have potential for occurring from the site during the construction period:

- 1. Groundwater may be intercepted during the construction of this project. While these locations are yet unknown, the Plan will be modified to incorporate these areas should they arise.
- 2. Pavement wash waters (where there have been no spills or leaks of toxic or hazardous materials).
- 3. Dust suppression water.
- 4. Water used to wash vehicles containing oil, grease, antifreeze, etc., (where detergents are not used and detention and/or filtering shall be provided before the water leaves the site).

All non-storm water discharges will be directed to stable settling basins prior to leaving the site outfall. Wash down or waste discharge of concrete trucks will not be permitted on-site unless a proper settlement area has been constructed in accordance with state and federal regulations.

#### 4.5 General Storm Water Quality Measures

The Contractor shall establish and maintain a proactive method to prevent litter, construction debris, and construction chemicals from entering waters of the State/U.S.

Locations where vehicles enter and exit the site shall be inspected for evidence of off-site roadway sediment tracking.

Low lying areas shall not be used as equipment storage, staging, or transportation areas.

If sediment escapes the construction site, off-site accumulations of sediment that have not reached a stream must be removed at a frequency sufficient to minimize offsite impacts. No work in streams is allowed with out special permit approval.

#### **Section 5**

#### **Storm Water Management**

#### **5.1 Storm Water Management Systems**

Adequate storm water management systems shall be designed to accomplish the following:

- 1 Account for both off-site and on-site storm water
- 2. Maintain natural topographic divides
- 3. Convey erosion and sediment controlled storm water to a stream, natural channel, or other existing facility
- 4. Discharge erosion and sediment controlled storm water into the natural channel by connecting the channel at natural elevations, or by discharging the storm water into an existing facility of sufficient capacity to receive it
- 5. BMPs will require periodic maintenance to ensure proper performance

#### **5.2 Required Records**

The Contractor will maintain at the site the following records of construction activities:

- 1. The dates when major grading activities occur;
- 2. The dates when construction activities temporarily or permanently cease on a portion of the site;
- 3. The dates when stabilization measures are initiated; and
- 4. Daily rainfall amounts
- 5. Required Inspection Records/Reports

The Fort Campbell Directorate of Public Works, Environmental Division will retain copies of storm water pollution prevention plans and all reports required by this permit, and records of all data used to complete the Notice of Intent to be covered by this permit, for a period of at least three years from the date the Notice of Termination is filed.

#### 5.3 Maintenance

Inspection and maintenance of erosion and sediment control structures is to be performed on a regular basis throughout the life of the project. Inspections of erosion and sediment control measures shall be done before anticipated storm events (or series of storm events such as intermittent showers over one or more days), within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once per week.

It is recommended that the Contractor install a rain gauge on-site and maintain it in good working condition. The Contractor shall record daily precipitation amounts on the project and provide this information to the Fort Campbell Directorate of Public Works on a monthly basis.

Outfall points shall be inspected by the contractor to determine whether erosion and sediment control measures are effective in preventing siltation impacts to surrounding waters. Upon conclusion of the inspections, erosion and sediment control measures found to be ineffective shall be repaired, replaced, or modified before the next rain event, if possible, but in no case more than seven days after the condition is identified.

Sediment shall be removed from sediment control structures when the design capacity has been reduced by fifty percent. Sediment removed from sediment control structures shall be placed and be treated in a manner so that the sediment is contained within the project limits and does not migrate into waters of the State/U.S. During sediment removal, the Contractor shall take care to ensure that structural components of erosion control structures are not damaged and thus made ineffective. If damage does occur, the Contractor shall replace the structures at the Contractor's own expense.

The Contractor shall establish and maintain a proactive method to prevent the off-site migration or deposit of sediment on roadways used by Fort Campbell residents and the general public. Locations where vehicles enter and exit the site shall be inspected for evidence of off-site roadway sediment tracking.

Whenever there is a change in the scope of work of the project, which would be expected to have a significant effect on the discharge of pollutants to the water of the state and which has not otherwise been addressed the SWPPP will be modified.

#### **5.4 Enforcement**

If at any time it is determined by government representatives that the property owner/proponent or designated construction site inspector/manager is not preventing erosion and sediment control from leaving the site, additional controls shall be implemented immediately to correct at Contractor's expense.

If government representatives determine that adequate inspections and maintenance procedures are not being implemented, or the controls as designed are not meeting control performance objectives presented in this plan, or they violate state regulations, then government representatives shall issue a Stop Work Order until adequate controls are meet.

#### **5.5 Required State Inspection Form**

The contractor shall perform storm water inspections a minimum of twice-a-week and after a rain fall event of .5 inches or greater of rain in a 24 hours period for each construction site. See instructions in Item 5 of Fort Campbell's TN/KY Construction Storm Water Inspection Report Form (See Appendix E). This form shall be maintained on site or readily available to government inspection agencies upon request. A copy of the storm water inspection form shall be delivered each month (or sooner if contract is shorter) attached to the monthly invoice to the contracting agency or Fort Campbell's Environmental Storm Water Division located at 13 ½ Street building 2182 Fort Campbell, KY.

#### **5.6 Notice of Termination**

Site shall be 95% stabilized to design requirements. Warranty period is in place until contractor meets the 95% stabilization requirement for internal NOT requirement and requires three way concurrences by DPW Environmental Division, contracting agency, and design engineer to verify site is in compliance with NOT. A contractor cannot be relieved of completion of NOT without final stabilization unless the contracting agency has agreed to assume responsibility for final stabilization of the site in writing.

### Appendix A

## **Site Location Map**

### **Contractor's Checklist**

- ✓ Identify the location of at least one benchmark, Indicated with the proper elevation.
- ✓ A map of the site must be included with the SWPPP with the proposed construction area clearly outlined. SWPPPs for linear projects must specify the location of each end of the construction area. The map should outline the boundaries of the projects, developments and the construction site in relation to major roads, streams or other landmarks. The map should identify all outfalls where runoff will leave the property. Streams(s) receiving the discharge, and storm sewer system(s) conveying the discharge from all site outfalls should be clearly identified and marked on the map. An 8 ½ by 11 inch excerpt from the appropriate 7.5 minute United States Geological Survey (USGS) quad map, with the site centered, is preferred. This map can be incorporated in the site drawing in Appendix C.

# Appendix B

# **Existing & Proposed Conditions**

### **Contractor's Checklist**

- ✓ Drawing shall be a minimum of one 8 ½" x 11" sheet.
- ✓ Existing and Proposed Conditions may be presented on one plan sheet by distinguishing the two by light (\_\_point) and heavy (\_\_point) line weights, respectively.
- ✓ Plan scale shall be no less than 1" (one inch) = 100' (one hundred feet).
- ✓ Site plan shall include existing and proposed contours (2' intervals), buildings and paving. Also include any existing and proposed (permanent) storm water management structures on the property and include size, type, slope and invert elevation of the structures, as required to meet the objectives.
- **✓** Drawing will be labeled to identify the site name.

# **Appendix C**

### **Sediment & Erosion Control Plan**

### **Contractor's Checklist**

- ✓ Drawing shall be a minimum of one 8 ½" x 11" sheet
- ✓ Identify on site plan all temporary erosion and sediment control measures to be implemented during construction. See site map requirements at Appendix A
- ✓ Plan scale shall be no less than 1" (one inch) = 100' (one hundred feet).
- **✓** Identify location of all outfall points for storm water discharges from the site.

# Appendix D

# Specifications, BMPs and Typical Drawings

### **Contractor's Checklist**

✓ The following pages are specifications, BMPs and typical drawings for proper installation of stone pads, wash racks, check dams, silt fences, and straw bales. These are standard specifications and depending on topography of the construction site, installation can be altered to ensure erosion and sediment control is established, inspected, and maintained.

#### Section: 01 62 35

# SECTION 01 62 35 RECYCLED/RECOVERED MATERIAL

- 1.0 GENERAL
- 1.1. REFERENCES
- 1.2. OBJECTIVES
- 1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK
- 1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK
- 1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

Section: 01 62 35

#### 1.0 GENERAL

#### 1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

- U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
- 40 CFR 247 Comprehensive Procurement Guideline for Products Containing Recovered Materials

#### 1.2. OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

#### 1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials, when incorporated into the work under this contract, shall contain at least the minimum percentage of recycled or recovered materials indicated by EPA unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

#### 1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

# 1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be use by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

End of Section 01 62 35

# SECTION 01 78 02.00 10 CLOSEOUT SUBMITTALS

- 1.1. SUBMITTALS
- 1.2. PROJECT RECORD DOCUMENTS
- 1.3. EQUIPMENT DATA
- 1.4. CONSTRUCTION WARRANTY MANAGEMENT
- 1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING
- 1.6. OPERATION AND MAINTENANCE MANUALS
- 1.7. FIELD TRAINING
- 1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY
- 1.9. LEED REVIEW MEETINGS
- 1.10. RED ZONE MEETING
- 1.11. FINAL CLEANING
- 1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

#### **EXHIBIT 1 SAMPLE RED ZONE MEETING CHECKLIST**

1.0

Section: 01 78 02.00 10

#### 1.1. SUBMITTALS

**OVERVIEW** 

Government approval is required for any submittals with a "G" designation; submittals not having a "G" designation are for Designer of Record approval or for information only. Submit the following in accordance with Section 01 33 00 submittals:

#### SD-02 Shop Drawings

- As-Built Drawings G
- Drawings showing final as-built conditions of the project. Provide electronic drawing files as specified in Section 01 33 16, 3 sets of blue-line prints, one set of reproducible mylar drawings and one set of the approved working as-built drawings.

#### SD-03 Product Data

- As-Built Record of Equipment and Materials
- Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.
- Construction Warranty Management Plan
- Three sets of the construction warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.
- Warranty Tags
- Two record copies of the warranty tags showing the layout and design.
- Final Cleaning
- Two copies of the listing of completed final clean-up items.

#### 1.2. PROJECT RECORD DOCUMENTS

#### 1.2.1. As-Built Drawings – G

An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

#### 1.2.2. Maintenance of As-Built Drawings

- 1.2.2.1. The Configuration Management Plan shall describe how the Contractor will maintain up-to-date drawings, how it will control and designate revisions to the drawings and specifications (In accordance with Special Contract Requirement: **Deviating from the Accepted Design** and Section 01 33 16: **Design after Award**, the Designer of Record's approval is necessary for any revisions to the accepted design).
- 1.2.2.2. Make timely updates, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the construction drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Perform this update no less frequently

than weekly for the blue line drawings and update no less frequently than quarterly for the CADD/CAD and BIM files, which were prepared previously in accordance with Section 01 33 16. Include a confirmation that the as-builts are up to date with the submission of the monthly project schedule.

- 1.2.2.3. If the DB Contractor fails to maintain the as-built drawings as required herein, the Government will retain from the monthly progress payment, an amount representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole will be withheld until the Contractor submits acceptable as-built drawings and the Government approves them.
- 1.2.2.4. The marked-up set of drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.
- 1.2.2.5. Typically, room numbers shown on the drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.
- 1.2.2.6. If there is no separate contract line item (CLIN) for as-built drawings, the Government will withhold the amount of \$35,000, or 1% of the present construction value, whichever is the greater, until the final as-built drawing submittal has been approved by the Government.

#### 1.2.3. Underground Utilities

The drawings shall indicate, in addition to all changes and corrections, the actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Locate Valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record average elevation of the top of each run or underground structure..

#### 1.2.4. Partial Occupancy

For projects where portions of construction are to be occupied or activated before overall project completion, including portions of utility systems, supply as-built drawings for those portions of the facility being occupied or activated at the time the facility is occupied or activated. Show this same as-built information previously furnished on the final set of as-built drawings.

#### 1.2.5. As-Built Conditions That are Different From the construction Drawings

Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the construction drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in CADD format. Reference the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing shall reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected clearly reflect options selected on final as-built drawings.

1.2.6. Additional As-Built Information that Exceeds the Detail Shown on the construction Drawings:

These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after the time of approved shop

drawings. It is recognized that these shop drawing submittals (revised showing as-built conditions) will serve as the as-built record without actual incorporation into the construction drawings, piping, and equipment drawings. Include locations of all explorations, logs of all explorations, and results of all laboratory testing, including those provided by the Government. Furnish all such shop drawings in CADD /CADformat. Include fire protection details, such as wiring, performed for the design of the project.

#### 1.2.7. Final As-Built Drawings

Submit final as-built CADD/CAD and BIM Model(s) and Facility Data files at the time of Beneficial Occupancy of the project or at a designated phase of the project. In the event the Contractor accomplishes additional work after this submittal, which changes the as-built conditions, submit a new DVD with all drawing sheets, one copy of affected Mylars and three blue-line copies of affected sheets which depict additional changes.

#### 1.2.8. Title Blocks

In accordance with the configuration management plan, clearly mark title blocks to indicate final as-built drawings.

#### 1.2.9. Other As-Built Documents

Provide scans of all other documents such as design analysis, catalog cuts, certification documents that are not available in native electronic format in an organized manner in Adobe.pdf format.

#### 1.2.9.1. LEED Documentation

Update LEED documentation on at least a monthly basis and have it available for review by the Government on the jobsite at all times during construction. Submit the final LEED Project Checklist(s), final LEED submittals checklist and complete project documentation, verifying the final LEED score and establishing the final rating. Provide full support to the validation review process, including credit audits. See also the LEED documentation requirements in Section 01 33 16, DESIGN AFTER AWARD.

#### 1.2.9.2. GIS Documentation

Provide final geo-referenced GIS database of the new building footprint along with any changes made to exterior of the building. The intent of capturing the final building footprint and exterior modifications in a GIS database is to provide the installation with a data set of the comprehensive changes made to the landscape as a result of the construction project. The Government will incorporate this data set into the installations existing GIS MasterPlan or Enterprise GIS system. The GIS database deliverable shall follow a standard template provided to the Contractor by the Government, adhere to detailed specifications outlined in ECB No 2006-15, and be documented using the Federal Geographic Data Committee (FGDC) metadata standard.

#### 1.3. EQUIPMENT DATA

#### 1.3.1. Real Property Equipment

Provide an Equipment-in-Place list of all installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. Include the cost of each piece of installed property F.O.B. construction site. For each of the items which is specified herein to be guaranteed for a specified period from the date of acceptance thereof, provide the following information: The name, serial and model number address of equipment supplier, or manufacturer originating the guaranteed item. The Contractor's guarantee to the Government of these items will not be limited by the terms of any manufacturer's guarantee to the Contractor. Furnish the list as one (1) reproducible and three (3) copies

thirty (30) calendar days before completion of any segment of the contract work which has an incremental completion date.

#### 1.3.2. Maintenance and Parts Data

Furnish a brochure, catalog cut, parts list, manufacturer's data sheet or other publication showing detailed parts data on all other equipment subject to repair and maintenance procedures not otherwise required in Operations and Maintenance Manuals specified elsewhere in this contract. Distribution of directives shall follow the same requirements as listed in paragraph above.

#### 1.3.3. Construction Specifications

Furnish permanent electronic files of final as-built construction specifications, including modifications thereto, with the as-built drawings.

#### 1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.4.1. Prior to the end of the one year warranty, the Government may conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging". The Contractor shall replace all damaged materials and locate and repair sources of moisture penetration.

#### 1.4.2. Management

#### 1.4.2.1. Warranty Management Plan

Develop a warranty management plan containing information relevant to the clause *Warranty of Construction* in FAR 52.246-21. Submit the warranty management plan for Government approval at least 30 days before the planned pre-warranty conference. In the event of phased turn-over of the contract, update the Warranty Management Plan as necessary to include latest information required. Include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Submit warranty information made available during the construction phase prior to each monthly pay estimate. Assemble information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. The Contractor, Government, including the Customer Representative shall jointly conduct warranty inspections, 4 months and 9 months, after acceptance. The warranty management plan shall include, but shall not be limited to, the following information:

- (1) Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the contractors, subcontractors, manufacturers or suppliers involved.
- (2) Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.
- (3) A list for each warranted equipment, item, feature of construction or system indicating:
- (i) Name of item.
- (ii) Model and serial numbers.
- (iii) Location where installed.

- (iv) Name and phone numbers of manufacturers or suppliers.
- (v) Names, addresses and telephone numbers of sources of spare parts.
- (vi) Warranties and terms of warranty. Include one-year overall warranty of construction. Indicate those items, which have extended warranties with separate warranty expiration dates.
- (vii) Cross-reference to warranty certificates as applicable.
- (viii) Starting point and duration of warranty period.
- (ix) Summary of maintenance procedures required to continue the warranty in force.
- (x) Cross-reference to specific pertinent Operation and Maintenance manuals.
- (xi) Organization, names and phone numbers of persons to call for warranty service.
- (xii) Typical response time and repair time expected for various warranted equipment.
- (4) The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.
- (5) Procedure and status of tagging of all equipment covered by extended warranties.
- (6) Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

#### 1.4.3. Performance Bond

- 1.4.3.1. The Contractor's Performance Bond will remain effective throughout the construction warranty period.
- 1.4.3.2. In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Government shall have a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Government shall have the work performed by others, and after completion of the work, may make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.
- 1.4.3.3. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Government will have the right to recoup expenses from the bonding company.
- 1.4.3.4. Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 1.4.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Government to proceed against the Contractor as outlined in the paragraph 1.4.5.5 and/or above.

#### 1.4.4. Pre-Warranty Conference

Prior to contract completion, or completion of any phase or portion of contract to be turned over, and at a time designated by the Contracting Officer, the Contractor shall meet with the Government to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Government for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warrantied construction, will be continuously

Section: 01 78 02.00 10 Page 264 of 947

available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

1.4.5. Contractor's Response to Warranty Service Requirements.

Following Government oral or written notification, which may include authorized installation maintenance personnel, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and backcharge the construction warranty payment item established.

- 1.4.5.1. First Priority Code 1 Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.
- 1.4.5.2. Second Priority Code 2 Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
- 1.4.5.3. Third Priority Code 3 All other work to be initiated within 3 work days and work continuously to completion or relief.
- 1.4.5.4. The "Warranty Service Priority List" is as follows:
- Code 1 Air Conditioning System
- (a) Buildings with computer equipment.
- (b) Barracks, mess halls (entire building down).
- Code 2 Air Conditioning Systems
- (a) Recreational support.
- Air conditioning leak in part of building, if causing damage. (b)
- (c) Air conditioning system not cooling properly
- (d) Admin buildings with Automated Data Processing (ADP) equipment not on priority list.
- Code 1 Doors
- Overhead doors not operational. (a)
- Code 1 Electrical
- (a) Power failure (entire area or any building operational after 1600 hours).
- Traffic control devices. (b)
- (c) Security lights.
- (d) Smoke detectors and fire alarm systems
- Power or lighting failure to an area, facility, portion of a facility, which may adversely impact (e) health, safety, security, or the installation's mission requirement, or which may result in damage to property.
- Code 2 Electrical
- Power failure (no power) for unoccupied buildings or portions thereof or branch circuits within (a) occupied buildings, not listed as Code 1.
- Receptacle and lights, not listed as code 1. (a)

- Code 3 Electrical
- (a) Street, parking area lights
- Code 1 Gas
- (a) Leaks and breaks.
- (b) No gas to cantonment area.
- Code 1 Heat
- (a) Area power failure affecting heat.
- (b) Heater in unit not working.
- Code 2 Heat
- (a) All heating system failures not listed as Code 1.
- Code 3 Interior
- (a) Floor damage
- (b) Paint chipping or peeling
- Code 1 Intrusion Detection Systems N/A.
- Code 2 Intrusion Detection Systems other than those listed under Code 1
- Code 1 Kitchen Equipment
- (a) Dishwasher.
- (b) All other equipment hampering preparation of a meal.
- Code 2 Kitchen Equipment
- (a) All other equipment not listed under Code 1.
- Code 2 Plumbing
- (a) Flush valves not operating properly
- (b) Fixture drain, supply line commode, or water pipe leaking.
- (c) Commode leaking at base.
- Code 3 Plumbing
- (a) Leaking faucets
- Code 1 Refrigeration
- (a) Mess Hall.
- (b) Medical storage.
- Code 2 Refrigeration
- (a) Mess hall other than walk-in refrigerators and freezers.
- Code 1 Roof Leaks
- (a) Temporary repairs will be made where major damage to property is occurring.
- Code 2 Roof Leaks
- (a) Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.
- Code 1 Sprinkler System

- (a) All sprinkler systems, valves, manholes, deluge systems, and air systems to sprinklers.
- Code 1 Tank Wash Racks (Bird Baths)
- (a) All systems which prevent tank wash.
- Code 1 Water (Exterior)
- (a) Normal operation of water pump station.
- Code 2 Water (Exterior)
- (a) No water to facility.
- Code 1 Water, Hot (and Steam)
- (a) Barracks (entire building).
- Code 2 Water, Hot
- (a) No hot water in portion of building listed under Code 1
- 1.4.5.5. Should parts be required to complete the work and the parts are not immediately available, the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Government, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Government will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Government will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.
- 1.4.6. Equipment Warranty Identification Tags
- 1.4.6.1. Provide warranty identification tags at the time of installation and prior to substantial completion shall provide warranty identification tags on all Contractor and Government furnished equipment which the Contractor has installed.
- (a) The tags shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Tag each component of contractor furnished equipment that has differing warranties on its components.
- (b) Submit sample tags, representing how the other tags will look, for Government review and approval.
- (c) Tags for Warrantied Equipment: The tag for this equipment shall be similar to the following: Exact format and size will be as approved.

EQUIPMENT WARRANTY - CONTRACTOR FURNISHED EQUIPMENT
MFG NAME MODEL NO.
SERIAL NO.
CONTRACT NO.
CONTRACTOR NAME
CONTRACTOR WARRANTY EXPIRES
MFG WARRANTY(IES) EXPIRE

EQUIPMENT WARRANTY - GOVERNMENT FURNISHED EQUIPMENT
MFG NAME MODEL NO.
SERIAL NO.
CONTRACT NO.
DATE EQUIP PLACED IN SERVICE

Section: 01 78 02.00 10

MFG WARRANTY(IES) EXPIRE

- (d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag
- 1.4.6.2. Execution: Complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.
- 1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Submit; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems prior to final inspection and transfer of the completed facility for approval, as specified in applicable technical specification sections.

#### 1.6. OPERATION AND MAINTENANCE MANUALS

- 1.6.1. General Requirements
- 1.6.1.1. Inasmuch as the operations and maintenance manuals are required to operate and maintain the facility, the operations and maintenance (O&M) manuals will be considered a requirement prior to substantial completion of any facility to be turned over to the Government. Beneficial occupancy of all or portions of a facility prior to substantial completion will not relieve the Contractor of liquidated damages, if substantial completion exceeds the required completion date.
- 1.6.1.2. Provide one permanent electronic copy on CD-ROM and 2 hard copies of the Equipment Operating, Maintenance, and Repair Manuals. Provide separate manuals for each utility system as defined hereinafter. Submit Operations and Maintenance manuals for approval before field training or 90 days before substantial completion (whichever occurs earlier). If there is no separate CLIN for O&M Manuals, the Government will withhold an amount representing \$20,000, as non-progressed work, until submittal and approval of all O&M manuals are complete.
- 1.6.2. Definitions
- 1.6.2.1. Equipment

A single piece of equipment operating alone or in conjunction with other equipment to accomplish a system function.

#### 1.6.2.2. System

A combination of one or more pieces of equipment which function together to accomplish an intended purpose (i.e. HVAC system is composed of many individual pieces of equipment such as fans, motors, compressors, valves, sensors, relays, etc.)

#### 1.6.3. Hard Cover Binders

The manuals shall be hard cover with posts, or 3-ring binders, so sheets may be easily substituted. Print the following identification on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS," the project name, building number, and an indication of utility or systems covered, the name of the Contractor, and the Contract number. Manuals shall be approximately 8-1/2 by 11-inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for the project must be similar in appearance, and be of professional quality.

#### 1.6.4. Warning Page

Provide a warning page to warn of potential dangers (if they exist, such as high voltage, toxic chemicals,

Provide a warning page to warn of potential dangers (if they exist, such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, high pressures, etc.). Place the warning page inside the front cover and in front of the title page. Include any necessary Material Safety Data Sheets (MDSD) here.

#### 1.6.5. Title Page

The title page shall include the same information shown on the cover and show the name of the preparing firm and the date of publication.

#### 1.6.6. Table of Contents

Section: 01 78 02.00 10

Each volume of the set of manuals for this project shall include a table of contents, for the entire set, broken down by volume.

#### 1.6.7. GENERAL

Organize manuals according to the following format, and include information for each item of equipment Submit a draft outline and table of contents for approval at 50% contract completion.

#### TABLE OF CONTENTS

PART I: Introduction

- Equipment Description
- Functional Description
- Installation Description

PART II: Operating Principles

PART III: Safety

PART IV: Preventive Maintenance

- Preventive Maintenance Checklist, Lubrication
- Charts and Diagrams

PART V: Spare Parts Lists

- Troubleshooting Guide
- Adjustments
- Common Repairs and Parts Replacement

PART VI: Illustrations

#### 1.6.7.1. Part I-Introduction

Part I shall provide an introduction, equipment or system description, functional description and theory of operation, and installation instructions for each piece of equipment. Include complete instructions for uncrating, assembly, connection to the power source and pre-operating lubrication in the installation instructions as applicable. Illustrations, including wiring and cabling diagrams, are required as appropriate in this section. Include halftone pictures of the equipment in the introduction and equipment description, as well as system layout drawings with each item of equipment located and marked. Do not use copies of previously submitted shop drawings in these manuals.

#### 1.6.7.2. Part II-Operating Principles

Part II shall provide complete instructions for operating the system, and each piece of equipment. Illustrations, halftone pictures, tables, charts, procedures, and diagrams are required when applicable. This will include step-by-step procedures for start-up and shutdown of both the system and each component piece of equipments, as well as adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions. Show performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates here, also. Marked-up catalogs or catalog pages do not satisfy this requirement. Present performance information as concisely as possible with only data pertaining to equipment actually installed. Include actual test data collected for Contractor performance here.

#### 1.6.7.3. Part III-Safety

Part III shall contain the general and specific safety requirements peculiar to each item of equipment. Repeat safety information as notes cautions and warnings in other sections where appropriate to operations described.

#### 1.6.7.4. Part IV-Preventive Maintenance

Part IV shall contain a troubleshooting guide, including detailed instructions for all common adjustments and alignment procedures, including a detailed maintenance schedule. Also include a diagnostic chart showing symptoms and solutions to problems. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings. Include instructions for the removal, disassembly, repair, reassembly, and replacement of parts and assemblies where applicable and the task is not obvious.

#### 1.6.7.5. Part V-Spare Parts List

Part V shall contain a tabulation of description data and parts location illustrations for all mechanical and electrical parts. The heading of the parts list shall clearly identify the supplier, purchase order number, and equipment. Include the unit price for each part. List parts by major assemblies, and arrange the listing in columnar form. Include names and addresses of the nearest manufacturer's representatives, as well as any special warranty information. Provide a list of spare parts that are recommended to be kept in stock by the Government installation.

#### 1.6.7.6. Part VI-Illustrations

Part VI shall contain assembly drawings for the complete equipment or system and for all major components. Include complete wiring diagrams and schematics. Other illustrations, such as exploded views, block diagrams, and cutaway drawings, are required as appropriate.

#### 1.6.8. Framed Instructions

Post framed instructions are required for substantial completion. Post framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, including equipment, ductwork, piping valves, dampers, and control sequence at a location near the equipment described. Prepare condensed operating instructions explaining preventive maintenance procedures methods of checking the system for normal safe operation, valve schedule and procedures for safely starting and stopping the system in type form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Submit proposed diagrams, instructions, and other sheets prior to posting. Post the framed instructions before field training.

#### 1.6.9. (Reserved. See 1.7 for Field Training)

#### 1.6.10. System/Equipment Requirements

### 1.6.10.1. Facility Heating System

Section: 01 78 02.00 10

Provide information on the following equipment: boilers, water treatment, chemical feed pumps and tanks, converters, heat exchangers, pumps, unit heaters, fin-tube radiation, air handling units (both heating only and heating and cooling), and valves (associated with heating systems).

#### 1.6.10.2. Air-Conditioning Systems

Provide information in chillers, packaged air-conditioning equipment, towers, water treatment, chemical feed pumps and tanks, air-cooled condensers, pumps, compressors, air handling units, and valves (associated with air-conditioning systems).

#### 1.6.10.3. Temperature Control and HVAC Distribution Systems

Provide all information described for the following equipment: valves, fans, air handling units, pumps, boilers, converters and heat exchangers, chillers, water cooled condensers, cooling towers, and fin-tube radiation, control air compressors, control components (sensors, controllers, adapters and actuators), and flow measuring equipment.

#### 1.6.10.4. Central Heating Plants

Provide the information described for the following equipment: boilers, converters, heat exchangers, pumps, fans, steam traps, pollution control equipment, chemical feed equipment, control systems, fuel handling equipment, de-aerators, tanks (flash, expansion, return waters, etc.), water softeners, and valves.

#### 1.6.10.5. Heating Distribution Systems

Provide the information described for the following equipment: valves, fans, pumps, converters and heat exchangers, steam traps, tanks (expansion, flash, etc.), and piping systems.

#### 1.6.10.6. Exterior Electrical Systems

Provide information on the following equipment: power transformers, relays, reclosers, breakers, and capacitor bank controls.

#### 1.6.10.7. Interior Electrical Systems

Provide information on the following equipment: relays, motor control centers, switchgear, solid state circuit breakers, motor controller, EPS lighting systems, wiring diagrams and troubleshooting flow chart on control systems, and special grounding systems.

#### 1.6.10.8. Energy Monitoring and Control Systems

The maintenance manual shall include descriptions of maintenance for all equipment, including inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components.

#### 1.6.10.9. Domestic Water Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentation, laboratory test equipment, chemical feeders, valves, switching gear, and automatic controls.

#### 1.6.10.10. Wastewater Treatment Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentations, laboratory test equipment chemical feeders, valves, scrapers, skimmers, comminutors, blowers, switching gear, and automatic controls.

#### 1.6.10.11. Fire Protection Systems

Provide information on the following equipment: alarm valves, manual valves, regulators, foam and gas storage tanks, piping materials, sprinkler heads, nozzles, pumps, and pump drivers.

#### 1.6.10.12. Fire Alarm and Detection Systems

- (1) The maintenance manual shall include description of maintenance for all equipment, including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
- (2) Provide all software; database with complete identification of programmable portions of system equipment and devices, and all other system programming data on all modes of the system; connecting cables; and proprietary equipment necessary for the operation, maintenance, testing, repair and programming, etc. of the system and that may be required for implementation of future changes to the fire system (additional and/or relocated initiating devices, notification devices, etc.
- (3) Provide all system and equipment technical data and computer software with the requisite rights to Government use, in accordance with the applicable contract clauses.
- (4) Training shall include software and programming required for the effective operation, maintenance, testing, diagnostics and expansion of the system.

#### 1.6.10.13. Plumbing Systems

Provide information on the following equipment: water heaters, valves, pressure regulators backflow preventors, piping materials, and plumbing fixtures.

#### 1.6.10.14. Liquid Fuels Systems

Provide information on the following equipment: tanks, automatic valves manual valves, filter separators, pumps, mechanical loading arms, nozzles, meters, electronic controls, electrical switch gear, and fluidic controls.

#### 1.6.10.15. Cathodic Protection Systems

Provide information on the following material and equipment: rectifiers, meters, anodes, anode backfill, anode lead wire, insulation material and wire size, automatic controls (if any), rheostats, switches, fuses and circuit breakers, type and size of rectifying elements, type of oil in oil-immersed rectifiers, and rating of shunts.

#### 1.6.10.16. Generator Installations

Provide information on the following equipment: generator sets, automatic transfer panels, governors, exciters, regulators starting systems, switchgear, and protective devices.

#### 1.6.10.17. Miscellaneous Systems

Provide information on the following: communication and ADP systems, security and intrusion alarm, elevators, material handling, active solar, photovoltaic, nurse call, paging, intercom, closed circuit TV, irrigation, sound and material delivery systems, kitchen, refrigeration, disposal, ice making equipment, and other similar type special systems not otherwise specified.

#### 1.6.10.18. Laboratory, Environmental and Pollution Control Systems

Provide information on the following equipment: wet scrubbers, quench chambers, scrub tanks, liquid oil separators, and fume hoods.

#### 1.7. FIELD TRAINING

Field Training is a requirement for substantial completion. Conduct a training course for the operating staff for each particular system. Conduct the training is to be conducted during hours of normal working time after the system is functionally complete. The field instructions shall cover all of the items contained in the Equipment Operating, Maintenance and Repair Manuals. The training will include both classroom and "hands-on" training. Submit a lesson plan outlining the information to be discussed during training periods. Submit this lesson plan for approval 90 days before contract completion before the field training occurs. Record training on DVD and furnish to the Government within ten (10) days following training. Document all training and furnish a list of all attendees.

# 1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

Promptly furnish and require any sub-contractor or supplier to furnish, in like manner, unit prices and descriptive data required by the Government for Property Record purposes of fixtures and equipment furnished and/or installed by the Contractor or sub-contractor, except prices do not need to be provided for Government-Furnished Property.

#### 1.9. LEED REVIEW MEETINGS

- 1.9.1. Pre-Closeout Meeting. Approximately 30 days before submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the documentation, determine which, if any, credits will be audited and identify any corrections/missing items prior to the closeout LEED documentation submittal.
- 1.9.2. Approximately 14 days after submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the LEED closeout documentation. The review conference will include discussion of and resolution of all review comments to ensure consensus on achievement of credits and satisfactory documentation. At the review conference a final score will be determined and endorsed in writing by all parties.

#### 1.10. RED ZONE MEETING

At approximately 80% of contract completion or 60 days before the anticipated Beneficial Occupancy Date (BOD), whichever occurs first, the Contractor and the Government's project delivery team will conduct what is known as the Red Zone Meeting to discuss the close-out process, to schedule the events and review responsibilities for actions necessary to produce a timely physical, as well as fiscal, project close-out. The Red Zone meeting derives its name from the football term used to describe the team effort to move the ball the last 20 yards into the end zone. The close-out of a construction project sometimes can be equally as hard and most definitely requires the whole team's efforts. The ACO will chair the meeting. If not already provided, shortly before the meeting, the Contractor shall provide an electronic copy or access to the CADD as-built drawings, completed commensurate with the amount of work completed at the time of the Red Zone Meeting, as an indicator of the Contractors' understanding of and ability to meet the USACE CADD Standards and to ensure that the Contractor is making progress with CADD As-Built requirements. EXHIBIT 1 is a generic meeting checklist.

#### 1.11. FINAL CLEANING

Clean the premises in accordance with FAR clause 52.236-12 and additional requirements stated here. Remove stains, foreign substances, and temporary labels from surfaces. Vacuum carpet and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean or replace filters of operating equipment if cleaning isn't possible or practicable. Remove debris from roofs, drainage systems, gutters, and downspouts. Sweep paved areas and rake clean landscaped areas. Remove waste, surplus materials, and rubbish from the site. Remove all temporary structures, barricades, project signs, fences

Section: 01 78 02.00 10

#### 1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

and construction facilities. Submit a list of completed clean-up items on the day of final inspection.

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft provided with the final design package(s) (see Section 01 33 16, paragraph 3.7.5) and submit an accounting of all installed property on Interim Form DD1354 "Transfer and Acceptance of Military Real Property." Include any additional assets/improvements/alterations and cost updates from the Draft DD Form 1354. Contact the COR for any project specific information necessary to complete the DD Form 1354. This form will be a topic for the Red Zone Meeting discussed above. For information purposes, a blank DD Form 1354 (fill-able) in ADOBE (PDF) may be obtained at the following web site: <a href="http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf">http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf</a> Submit the completed Checklist for Form DD1354 of Government-Furnished and Contractor-Furnished/Contractor Installed items. Attach this list to the updated DD Form 1354. Instructions for completing the form may be obtained through the US Army Corps of Engineers TECHINFO Website at <a href="http://www.hnd.usace.army.mil/techinfo/">http://www.hnd.usace.army.mil/techinfo/</a> under publications, in Unified Facilities Criteria UFC 1-300-08.

EXHIBIT 1

### SAMPLE

### Red Zone Meeting Checklist

$\checkmark$	

User move-in	
DD Form 1354, Transfer of Real Property completed & signed	
Ribbon cutting	
Payroll Clearances	
DD Form 2626 - Construction Contractor Performance Evaluation	
DD Form 2631 – A-E Performance Rated after Construction	
Status of Pending Mods and REA's/Claims	
Final Payment Completed	
Release of Claims	
Return of Unobligated Funds	
Move Project from CIP to General Ledger	
Financial completion	

End of Section 01 78 02.00 10



# REPORT OF PRELIMINARY SITE **CHARACTERIZATION**

Range 44 Live Fire Shoothouse Complex Ft Campbell

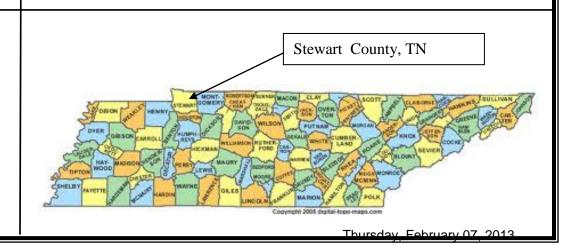
### **March 2012**



Prepared by: P. Zorko Reviewed by: S. Hite



Status: Final





#### DEPARTMENT OF THE ARMY

U.S. ARMY ENGINEER DISTRICT, LOUISVILLE CORPS OF ENGINEERS P.O. BOX 59 LOUISVILLE KY 40201-0059

http://www.lrl.usace.army.mil/

CELRL-ED-T-G

26 March 2012

MEMORANDUM FOR CELRL-ED-M-A (Corrigan)

SUBJECT: Range 44A Live Fire Shoothouse, Fort Campbell, KY

- 1. CELRL-ED-T-G has completed the requested preliminary geotechnical exploration for the subject project. A preliminary report has been prepared to characterize the surface and subsurface conditions at the project site. The report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations.
- 2. The point of contact is Paul Zorko at (502) 315-3834 regarding the information presented in this report.

Paul L. Zorko, P.G

Project Geologist

For Steven A. Hite, P.E. Project Checker

Attachment: Report of Preliminary Site Characterization

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

### TABLE OF CONTENTS

SE	CTIO	<u>N</u>	PAGE
1.	BAC 1.1 1.2	KGROUNDPROJECT INFORMATIONSITE GEOLOGY AND SEISMICITY	4 4 4
2.	SITE 2.1	CONDITIONSEXISTING SITE CONDITIONS	
	2.2	2.1.1 Abandoned Structures and Utilities	5
3.	EXP 3.1 3.2 3.3 3.4 3.5	FIELD SAMPLING AND TESTING	
4.	LIM	TATIONS	11
AP AP AP	PEND PEND PEND	DIX A	DRAWINGS FIELD TESTING LABORATORY TESTING
EIC	GURE	LIST OF FIGURES	PAGE
		Progressive Development of Sinkholes	
<u>TA</u>	BLE	LIST OF TABLES	<u>PAGE</u>
Tal	ole 3.2	. SPT Sample Intervals	9
		Drilling Termination Elevations	

Section: APPENDIX A W912QR-234137

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

#### 1. BACKGROUND

#### 1.1 PROJECT INFORMATION

General project information was provided by Daniel Corrigan of CELRL-ED-M-A. The proposed Range 44 Live Fire Shoothouse (LFSH) Complex (Project 71712) is located in Stewart County, Tennessee portion of Fort Campbell, KY. A site location map is provided in Appendix B. The following documents were provided:

- Project Definition Report, dated January 7, 2011.
- Revised Site Plan RFP drawing, dated December 2011

This preliminary site characterization is being performed for the Range 44 LFSH Complex. Planned, is the construction of a 6 structure complex to include the shoothouse, a "glasshouse", an after action reporting (AAR) building, an operations/storage building, an ammunition breakdown building, a latrine and a small gravel parking area. These facilities will be single story masonry structures built with slabs-on-grade

#### 1.2 SITE GEOLOGY AND SEISMICITY

#### 1.2.1 Bedrock Geology

The bedrock geology of the Ft. Campbell area is composed of Mississippian aged St. Genevieve which overlies the St. Louis Limestone. The St. Louis Limestone is yellowish gray, light to olive gray, and dark gray to medium bluish gray, weathering to light gray to olive gray, very fine to medium grained, and is commonly bedded in layers less than 1 foot thick. This limestone is interbedded with dolomite and shale. The dolomite is medium dark gray to olive gray, weathering to yellowish gray, very fine to fine grained, 0.1 to 5.0 feet thick beds, commonly spalls on weathering, and contains crystalline calcite. Beds of carbonaceous shale, less than 0.3 ft thick, are present near the base of the unit. Chert occurs as irregular, spherical masses in a persistent zone near base and in limestone beds higher in the unit. The chert locally contains distinctive fossils. Experience with this geologic unit indicates the soil/rock surface is typically erratic, with soil-filled slots extending into the rock unit or with rock pinnacles extending up into the soil overburden. Because of the variability of the rock surface, the overburden thickness can vary from a few to tens of feet.

The St. Genevieve formation is a gray to white, slightly dark where weathered, thin to thick bedded, predominately oolitic, argillaceous and fossiliferous limestone which contains chert stringers. Native soils formed by the in-place solution weathering of this parent limestone formation typically consist of reddish brown clays that increase in plasticity from low to moderate with increasing depth. The soil/rock surface is typically erratic, and overburden thickness can vary. Dissolution features and sinkholes are common to the area based on a review of topographic mapping.

The bedrock structure of the area dips to the northwest at about 40-feet per mile.

Section: APPENDIX A W912QR-23413770 CERTIFIED FINAL-003 Page 281 of 947

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

#### 1.2.2 Seismicity

The project site is located on the periphery of the New Madrid seismic region which has the potential to influence ground motions. A site-specific study to determine ground motion was beyond the scope of this report.

The approximate center of the site is found at latitude 36° 37' 31.52" North and longitude 87° 39' 47.13" West. For this study, the maximum credible earthquake (MCE) ground motions were represented by the spectral response accelerations for 2 percent probability of exceedance (PE) in 50 years, obtained from the 2009 International Building Code published by the United States Geological Survey (USGS). Using the USGS Java Ground Motion Parameter Calculator -**Version 5.1.0**, the spectral response acceleration parameter Ss (0.2 second period) is 0.507g, and the spectral response acceleration parameter  $S_1$  at a period of one second is 0.170g.

#### 2. SITE CONDITIONS

#### 2.1 EXISTING SITE CONDITIONS

A site reconnaissance was conducted on 13 January 2012 by ED-T-G personnel to observe and document surface conditions at the project site and to stake boring locations for the drilling contractor. The information gathered was used to help characterize the site.

The area of Range 44 selected for the project encompasses an area of approximately 10 acres and is located west of Killebrew Avenue and south of Angels Road at the north end of the Range 44 complex at Fort Campbell (Figure B-1).

At the time of the reconnaissance, the project site was primarily open mown field with several existing structures present. A wooded area approximately 2.5 acres in size is present in the southwest corner of the project site. Contained in this wooded area is a small closed depression (approximately 0.2 acres) that held standing water at the time of the site visit. Based on the presence of numerous sinkholes in the vicinity of Range 44 this depression could very well be the start of a sinkhole. The site is situated atop a knoll with the topography dropping off to the north, east and west. Surface drainage is controlled by swales present on either side of the main gravel road that bisects the site. Surface water from this drainage feature flows to the north and exits the west side of the site just south of the existing shoothouse. Photographs of the site are presented in Appendix A.

#### 2.1.1 Abandoned Structures and Utilities

The site is currently occupied by three structures. Building 44A, located at the northwest corner of the site is the existing shoothouse structure that has been condemned. A small bleacher building (Building 09031) is located approximately 125-feet east of Building 44A. Building 44H, located along the southern site boundary, is a two story structure that serves as a tactical operations building for field exercises. According to Ft Campbell range personnel the site was undeveloped prior to the construction of the existing structures.

Utilities on the site consists of a buried electric line that runs parallel to the east side of the unnamed gravel road that bisects the site. Pad mounted transformers are located adjacent to buildings 44H and 44A. No other utilities are present at the site.

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

#### 2.2 SINKHOLE DEVELOPMENT POTENTIAL

On the basis of a review of historical topographic mapping and aerial imagery of the Range 44 area, numerous potential sinkhole areas exist in the vicinity of the project site. One potential sinkhole depression was identified in the wooded area in the southwest portion of the site and is clearly identifiable based on the recent topographic survey of the site (Appendix B, Figure 2). This closed circular depression is roughly 80-feet in diameter and about 3 feet deep with standing water present at the time of the site visit. The following paragraphs help define the development of sinkholes.

The following sketches shown in Figure 1 provide a visual description of how sinkholes are formed and result in topographic depressions. Sinkhole development in areas underlain by limestone generally result from either a general raveling failure within the soil unit or by rock collapse. Either phenomenon typically results in depressions at the ground surface, which, if large enough, can be identified on topographic maps. Sinkholes begin at the rock surface and migrate toward the surface as raveling occurs. In many instances, sinkholes near the surface remain undetected by conventional exploration efforts.

Raveling failures are the most common of the subsidence phenomena that are associated with areas underlain by limestone formations. A typical scenario for sinkhole development caused by raveling begins with the natural rising and lowering of the groundwater table and is aggravated by surface water migration downward through the subsurface soils. The moving water typically mobilizes and transports soil particles from their original location into a lower lying strata. The movement of soil particles results in the formation of open voids in the overburden soil. With time these resulting voids in the soil zone spall and collapse under the forces of gravity or increased loading such as construction activity. This spalling can lead to the development of large voids or cavities within the soil unit. Continued long term water movement causes the void or cavity to progressively expand until the soil arch is thin enough and near the ground surface such that the soil collapses into the cavity and a dropout results. Surface erosion then continues to enlarge the dropout to a conical, rounded depression.

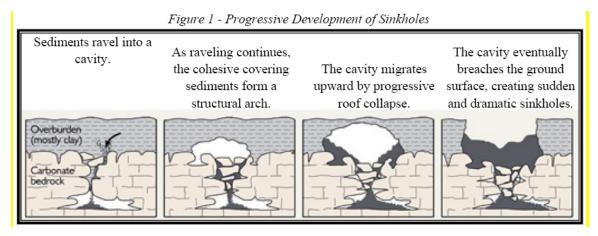


Figure 1. Progressive Development of Sinkholes

Additionally, as the water encounters the limestone bedrock, it continues to migrate downward into small fissures and bedding planes into the rock unit. With time, this migration of water may result in solution weathering of the limestone bedrock. The natural acidity in water migrating

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

through the bedrock reacts with the calcium-based limestone rock. This chemical reaction dissolves the bedrock, resulting in the formation of voids and cavities in the rock unit. The resulting open voids and cavities in the bedrock act as a conduit for movement of water and suspended solids.

The second type of subsidence is due to rock collapse. The development of caves within limestone bedrock is the result of prolonged, concentrated solution activity. Voids are created through the introduction of surface water into the subsurface, as described above. The voids thus created are then enlarged by continued flow of water through the area. As the voids become larger and eventually interconnect, the quantity of water flowing through the area increases and results in more weakened rock below, the rock then collapses, resulting in a surface depression (i.e. a sinkhole). However, large scale dropouts due to rock collapses are rare in the Fort Campbell area. In addition to the natural causes of sinkhole development previously discussed, solution activity may also result from fluids leaking from subsurface piping and drainage systems such as buried water and sewer pipes and roof drains beneath the building and floor slabs.

#### 3. EXPLORATORY FINDINGS

The subsurface conditions were explored with 11 soil test borings. Boring locations for the building and parking areas were determined by a geotechnical engineer based on the proposed site layout provided. A boring location map is provided in Appendix B.

Laboratory testing for the site consisted of moisture content, Atterberg limits, gradation analysis. A description of the subsurface conditions encountered with pertinent available physical properties is presented in the following sections.

#### 3.1 FIELD SAMPLING AND TESTING

Field sampling and testing were performed in general accordance with USACE or ASTM procedures and established geotechnical engineering practice. The samples obtained during the exploration consisted of driven (split-tube) sampling. The samples were visually classified in the field by the contractors geotechnical engineer and returned to the contractor's laboratory for testing.

The standard penetration test (SPT) is one of the most widely used field tests in geotechnical engineering. At regular intervals, soil samples are obtained with a standard 1.4-inch-inside-diameter (I.D.), 2-inch-outside-diameter (O.D.), split-tube sampler. The sampler is first seated 6 inches to penetrate any loose cuttings and then driven an additional 12 inches with blows of a 140-pound hammer free-falling 30 inches. The number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or *N*-value. The penetration resistance when properly evaluated is an index to the soil's strength.

Of the three boring depths used for the various facility structures, Standard Penetration Tests (SPT) samples were obtained in accordance with the sample intervals presented in Table 3.1. Borings were advanced to pre-determined depths or refusal, whichever is encountered first. A statistical analysis of normalized SPT  $(N_1)_{60}$  values is presented with the field data contained in Appendix C.

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

**Table 3.1. SPT Sampling Intervals** 

Building Boring (20') Sampling interval, (ft)	Building Boring (15') Sampling interval, (ft)	Parking Area Boring (8') Sampling interval, (ft)
0-1.5	0-1.5	0-1.5
1.5-3	1.5-3	1.5-3
4-5.5	4-5.5	4-5.5
6-7.5	6-7.5	6.5-8
9-10.5	9-10.5	
14-15.5	13.5-15	
18.5-20		

#### 3.2 LABORATORY TESTING

Laboratory testing for the site consisted of moisture content, Atterberg limits, gradation and specific gravity analyses as detailed in Table 3.2.

**Table 3.2. Laboratory Testing Program** 

Lab Test	Location	Quantity	Notes
Sieve and hydrometer analysis	All borings	9	SPT Samples
Moisture content	All borings	67	SPT Samples
Atterberg limits	All borings	9	SPT Samples

The results of the laboratory testing are provided in Appendix D.

Page 285 of 947

CELRL-ED-T-G

Section: APPENDIX A

SUBJECT: Range 44 LFSH, Fort Campbell, KY

#### 3.3 SUBSURFACE CONDITIONS

The boring logs represent the contractors geotechnical engineer's interpretation of the subsurface conditions based on the visual classification of field samples and laboratory tests of selected field samples. The interface between various strata on the boring logs represents the approximate interface location. Transitions between strata may be more gradual than shown. A brief summary of the boring logs is shown in Table 3.3, and the boring logs are located in Appendix C.

Approx. EL. Termination Top of Hole EL. Bottom of Auger Refusal Boring No. Depth (ft) (ft) Hole (ft) N/A B-1 20 657.5 637.5 N/A B-2 15 643.5 658.5 N/A B-3 15 657.5 642.5 N/A B-4 20 659.0 639.0 N/A B-5 20 658.5 643.5 N/A B-6 15 660.5 645.5 N/A B-7 20 661.0 641.0 N/A B-8 20 658.5 643.5 B-9 15 662.5 647.5 N/A N/A B-10 8 659.0 651.0 8 B-11 662.5 654.5 N/A 176 Total

**Table 3.3. Drilling Termination Elevations** 

### 3.3.1 Soil Test Borings

Topsoil was encountered at the ground surface, ranging from 2 to 16-inches thick, as indicated on the boring logs. Underlying the surficial topsoil layer, the borings generally encountered a single soil stratum described below.

Stratum I: The Stratum I soils generally consisted of lean clay (CL) extending from just below the topsoil to a depth of about termination depths of the 11 borings. Chert gravels were encountered in Typically the only vertical changes were in color only with the overall character of the soils consistent across the site. This stratum is considered native soil.

Standard penetration tests normalized to equivalent blow counts (N<sub>1</sub>)<sub>60</sub>-values ranged from 31 blows per foot (bpf) in the lower of Boring B-3 to 5 bpf in the upper portion of Boring B-5, with a median value of 12 bpf. The  $(N_1)_{60}$ -values are indicative of soils with firm to very stiff consistency. It should be noted that the higher SPT values obtained in the lower portions of several of the borings are likely attributed to chert gravels encountered during SPT testing which may result in inflated blow counts.

Soil plasticity tests (Atterberg limits) performed on selected samples indicated Liquid Limits ranging from 37 to 48, and Plasticity Indices ranging from 17 to 20. With the exception of topsoil, all soil samples were classified as lean clay "CL" type soils according to the Unified Soil

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

Classification System (USCS). The lower 6-feet of borings B-1 and B-4 both exhibited increasing plasticity with depth.

The moisture content of the samples tested ranged from 10.7 to 29.9 percent. These values are indicative of moist samples.

#### 3.4 GROUNDWATER CONDITIONS

Groundwater was not encountered in any of the 11 borings while drilling. Water levels and conditions could vary in areas where the subsurface investigation was not conducted. Typically, water conditions affecting construction projects are related to trapped or perched water, which occurs in irregular, discontinuous locations within the soil overburden or near the soil/rock interface. These perched water sources are often not linked to the more continuous relatively stable groundwater table that typically occurs at greater depths. Due to these factors as well as seasonal and climatic changes groundwater levels may vary from those measured at the time of the field operations.

#### 3.5 GEOPHYSICAL INVESTIGATIONS

Time Domain Electromagnetic Testing was conducted between 20-24 February 2012 at the Range 44A site. All geophysical investigations were performed in general conformance with procedures and regulations provided in Engineer Manual (EM) 1110-1-1802 *Geophysical Exploration for Engineering and Environmental Investigations*, dated 31 August 1995. This work was performed under the direction of a Geophysicist with a minimum 10 years experience. The results of this testing is affected by the presence of power lines and surface metal objects (steel sided buildings, dumpsters, vehicles, reinforced concrete, etc). Where such are present, the effects of materials in the subsurface may be masked, and firm conclusions about subsurface conditions cannot be made. A report of the Geophysical Investigations is presented in Appendix E.

#### 3.5.1 Time Domain Electro-Magnetic (TDEM) Survey

The objective of TDEM Testing was to detect and determine the location of metal containing buried waste, old building foundations, existing and abandoned utilities at the site. TDEM Testing is commonly referred to as an EM61 survey, which is the model of the instrument commonly used, a Geonics EM61-MK2A time domain electromagnetic induction metal detector. The EM61-MK2A is a time-domain electromagnetic induction type instrument designed specifically for detecting buried metal objects. A transmitter coil generates a pulsed primary magnetic field in the earth, thereby inducing eddy currents in nearby metal objects. The decay of the eddy current produces a secondary magnetic field that is sensed by two receiver coils, one coincident with the transmitter and one positioned 40 cm above the main coil. By measuring the secondary magnetic field after the current in the ground has dissipated but before the current in metal objects has dissipated, the instrument responds only to the secondary magnetic field produced by metal objects. Four channels of secondary response are measured in mV and are recorded on a digital data logger. The system is generally operated by pulling the coils as a trailer with a GPS recorder. For this investigation, data was acquired at six inch intervals along lines spaced five feet apart across the accessible portions of each site.

Section: APPENDIX A Page 287 of 947

CELRL-ED-T-G

SUBJECT: Range 44 LFSH, Fort Campbell, KY

#### 3.5.2 TDEM Testing Results

Testing results indicated numerous point source/spatial anomalies across the site not attributable to surface objects. No observable evidence of the existing buildings was identified on the ground surface at the time of data collection. The scattered nature of the point source anomalies across the site suggest they may be related to the area's use as an active training range as well as its proximity to the South Impact Area. The complete geophysical report is presented in Appendix E. There were a total of 29 anomalies greater than 2 meters in diameter. It was recommended by the geophysical contractor those anomalies be investigated further with shallow excavations in an effort to determine their source. Table 3.5.2 presents the grid coordinates of those 29 anomalies. These anomalies are also depicted on Figure 3 of the attached Geophysical Report.

Table 3.5.2 GIS Coordinates for Anomalies Greater Than 2 Meters in Diameter

Anomaly No.	Easting	Northing	Anomaly No.	Easting	Northing
1	440570.702	4053602.014	16	440711.489	4053563.414
2	440572.933	4053600.675	17	440725.546	4053570.554
3	440575.164	4053581.487	18	440703.234	4053540.433
4	440590.336	4053617.632	19	440658.833	4053552.704
5	440599.484	4053570.777	20	440657.049	4053544.672
6	440668.874	4053604.468	21	440590.336	4053535.971
7	440695.425	4053611.608	22	440585.651	4053531.954
8	440685.831	4053582.156	23	440621.350	4053502.503
9	440683.376	4053578.363	24	440622.019	4053496.925
10	440697.433	4053574.124	25	440611.532	4053488.447
11	440681.145	4053569.215	26	440619.342	4053477.067
12	440645.669	4053575.909	27	440680.030	4053491.347
13	440636.299	4053575.016	28	440714.167	4053493.578
14	440661.511	4053564.083	29	440570.033	4053401.431
15	440678.468	4053547.796			

Note: Northing WGS84 UTM16N, Easting WGS84 UTM16N

#### 4. LIMITATIONS

This preliminary report has been prepared to characterize the site conditions at the project site. This report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations. The Contractor's team shall include a licensed geotechnical engineer to interpret the subsurface conditions (assuming they are consistent with the site subsurface conditions described in this report) and develop earthwork and foundation requirements and design parameters on which to base the Contractor's proposal. Subsequent to award, the Contractor is required to perform and provide a complete geotechnical exploration of the proposed site from which to develop the final design. The geotechnical exploration shall be performed under the direction of a licensed professional engineer with at least 10 years experience specializing in geotechnical engineering. This exploration shall be the full responsibility of the Contractor.

## **Appendix A – Site Photographs**

**Photograph Location Map Site Photos** 

## Picture Log (FTC LFSH)

Date:	13 January 2012
<b>Location:</b>	Ft Campbell Range 44
By:	Paul Zorko

Photo #	1	Project site facing northwest (Building 44A to the left and Building 09031 to the right).
Photo #	2	Shoothouse site facing north from unnamed gravel road.
Photo #	3	Project site facing southeast (Building 44H).
Photo #	4	Project site facing northeast (pad mounted transformer serves Building 44H).
Photo #	5	Project Site facing south from Building 44A (pad mounted transformer serves Building 44A).
Photo #	6	Central portion of project site facing northeast.
Photo #	7	Project site facing south (Building 44H to the right).
Photo #	8	Project site facing southeast.

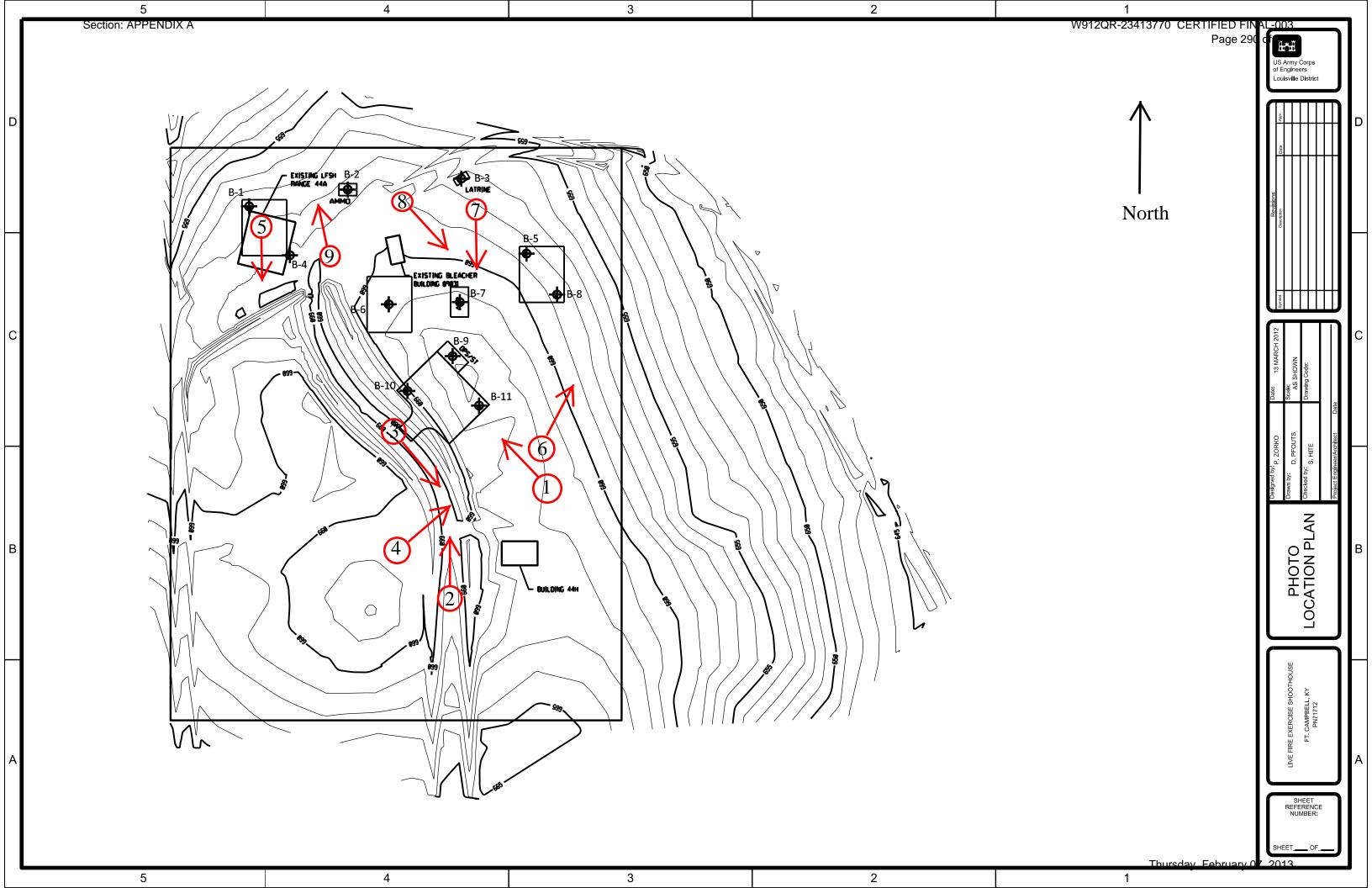




Photo 1 – Project site facing northwest (Building 44A to the left and Building 09031 to the right).



Photo 2 – Shoothouse site facing north from unnamed gravel road.



Photo 3 – Project site facing southeast (Building 44H).



Photo 4 - Project site facing northeast (pad mounted transformer serves Building 44H).



Photo 5 – Project Site facing south from Building 44A (pad mounted transformer serves Building 44A).



Photo 6 – Central portion of project site facing northeast.



Photo 7 – Project site facing south (Building 44H to the right).

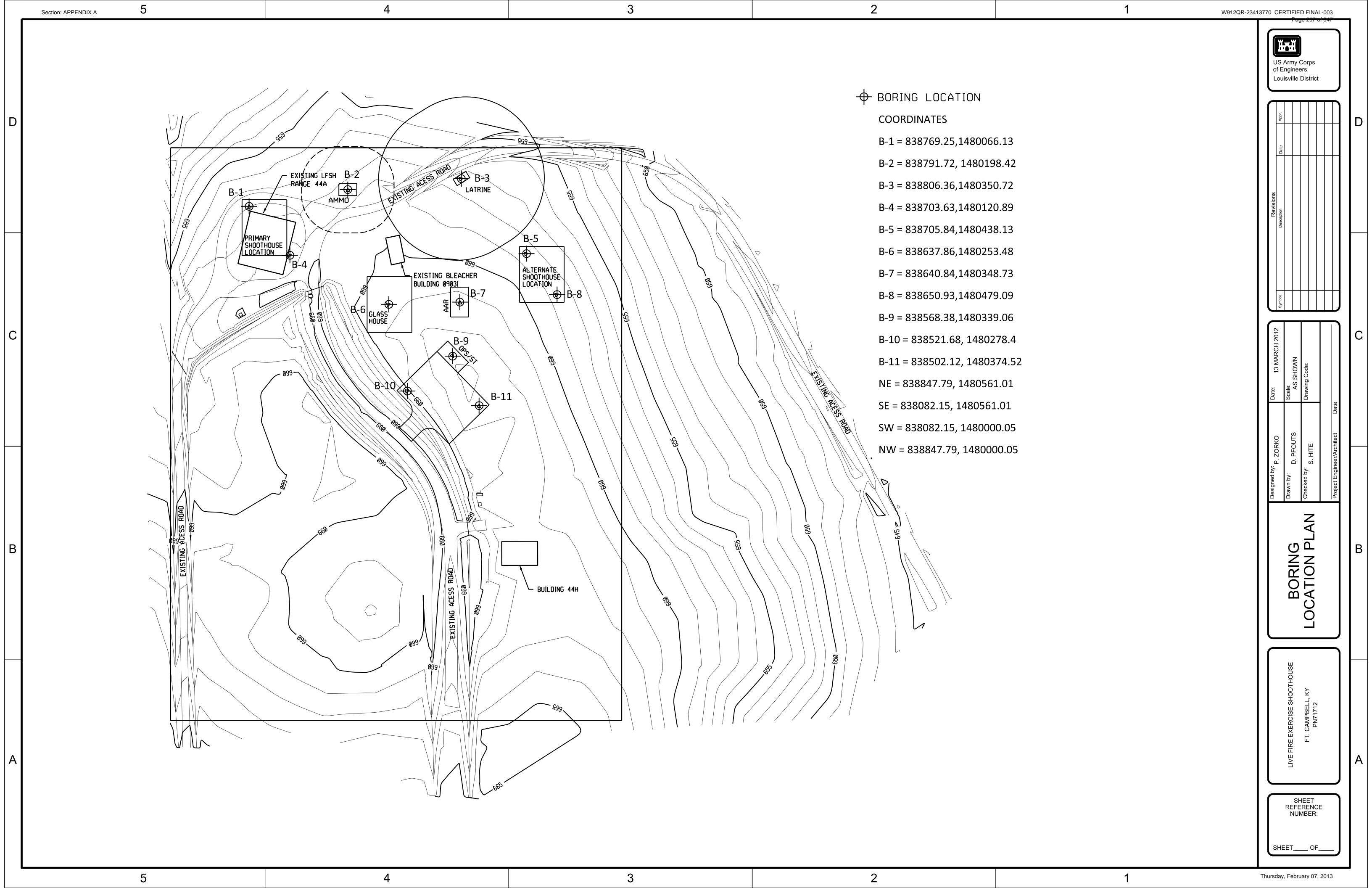


Photo 8 – Project site facing southeast.

# **Appendix B – Drawings**

Site Location Map Boring Location Map





## **Appendix C – Field Testing**

Section: APPENDIX A

Field Procedures Soil Classification Sheet Statistical Analysis of Normalized SPT Resistances,  $(N_1)_{60}$  - values Boring Logs

FIELD PROCEDURES

<u>Field Operations</u>: The general field procedures employed by the United States Army Corps of Engineers (USACE), Louisville District, are summarized in ASTM D420 *Investigating and Sampling Soils and Rocks for Engineering Purposes*. This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternative techniques depending upon the subsurface conditions. These techniques are:

- a. Continuous 2½ or 3¼ inch inside diameter (I.D.) hollow stem augers;
- b. Wash borings using roller cone or drag bits (using drilling mud or water);
- c. Continuous flight augers (ASTM D1425).

Section: APPENDIX A

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field boring log by a geologist or geotechnical engineer. The boring log contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring logs contain both factual and interpretive information. The field boring logs are maintained in the District office.

The soil and rock samples plus the field boring logs are reviewed by a geologist or geotechnical engineer who classifies the soils in general accordance with the procedures outlined in ASTM D2488 and prepares the final boring logs which are the basis for all evaluations and recommendations.

The final boring logs represent the interpretation of the contents of the field logs based on the results of the engineering examinations and tests of the field samples. These logs depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and groundwater conditions at these boring locations. The lines designating the interface between soil or refusal materials on the logs and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring logs are included with this report.

## FIELD PROCEDURES (continued)

Section: APPENDIX A

<u>Soil Test Borings</u>: Soil test borings were made at the site at locations shown on the Boring Location Plan. Soil sampling and penetration testing were performed in accordance with ASTM D1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch outside diameter (O.D.), split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer free falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance." The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the contractor's laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. The boring logs graphically show the soil descriptions and penetration resistances.

<u>Water Level Readings</u>: Water table readings are normally taken in conjunction with borings and are recorded on the boring logs. These readings indicate the approximate location of the hydrostatic water table at the time of the field investigation. Where impervious (more clayey) soils are encountered the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The groundwater table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring, water level reported on the boring logs is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, or by measurement after the drilling tools are withdrawn. Additional water table readings may be obtained after the borings are completed. A time lag of 24 hours may allow stabilization of the groundwater table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally, the borings will cave-in preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring logs.

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	GENERAL NOTES	METHODS OF EXPLORATION		SOIL DESCRIPTIVE TERMS	MS SIZE	0.1	SAMPLE TYPE	
1. REFUSAL IS DEFINED AS THE	REFUSAL IS DEFINED AS THE POINT BEYOND WHICH FURTHER PENETRATION WAS IMPRACTICAL WITH THE EXPLORATION METHOD USED SEE "METHODS OF EXPLORA.		PISTON SAMPLER	BOULDER	V 8 INCHES	•	DRIVE SAMPLE (STANDARD PENETRATION TEST)	(EST)
TION" THS SHEET INDICATE		_		COMPSE GRAVEL	3 INCHES TO 8 INCHES 3/4 INCH TO 3 INCH	<b>ν &lt;</b>	• UNDISTURBED SHELBY TUBE • AUGER	
2. WATER ELEVATIONS INDICAT				FINE GRAVEL COAPSE SAND	1/4 INCH TO3/4 INCH 2 NAJ TO 74 INCH		• FISHTAL	
FISHTAL (F), DENSON (U) & BY DRILLING OPERATIONS A TRUE GROUND WATER LEVE	FISHTAL (F.), DENSON (U) AND WASH (W) BORNGS MAY HAVE BEEN INFLICENCED FORLING OPERATIONS AND SHOULD NOT BE CONSTRUED AS INDICATING THE TRUE GROUND WATER LEVEL.	D DRIVE SAMPLER		MEDUM SAND FINE SAND	0.4 MM TO 2 MM 0.0075 MM TO 0.4 MM	> ₹	U • UNDISTURBED DENISON CU • UNDISTURBED CURE	
in a large of the Canada			NO.	TRACE	1 TO 102		· CORE	
	GNOOM RATER LEVELS WILL VAN IT A ROLDWANEL MIN HAWA VEL MEN STREAM THAN STREET OFFER THAN STREET OF STREET	_	TRENCH TEST PIT ROCK BIT	AND LAMINAE LENSE	36 TO 502 O TO 10 MM		J • JAR Bx • BOx (CORE)	
CONSTRUED AS INDICATING BORING LOCATION.				BAND	SO MM TO 2.5 INC LAYER	H 2.5 INCH TO 6 INCH-	NCH-	
4. WHEREVER THE METHOD OF RECOVERING SAMPLES ABO	WHEREVER THE WETHOD OF EXPLORATION PRECLUDED THE POSSBLITY OF RECOVERING SAMPLES ABOVE ROCK, SULFABLE FOR EXAMINATION OR TESTS, THE MATERIAL IS DENOTED AS OVERBURDEN.			LEGEND	Qı			
5. CLASSFICATIONS AND PHYSON THE LOCS WERE DETER ANALYSIS MADE BY THE DI	CLASSFICATIONS AND PHYSICAL CHARACTERSTICS OF SOIL AND ROCK AS SHOWN ON THE LOGS WERE DETERMINED BY ANALYSS MADE BY THE DISTRICT GEOLOGIST AND THE LABORATORY TECHNICANS.	<b>L.</b> P-	. Fil. . TOP SOL	WP · WELL	WELL POINT DIAG	G - DIAGONAL		
6 SUPPLEMENTAL INFORMATIO	N SUCH AS FIELD BOOKS, FIELD LOGS, 15515, FOR	ક્ષ્યું જ જ	·ğ·			• • • •		
STEAR, CONSOLUDATION, TEL LOGS MAY BE VEWED IN U.S. ARMY ENGREER DISTRA OFFICE BIRD DAKE LOUVELE	AMERICAL TOTAL WARN FEET OWNER, DONNER FOR THE OFFICE OF THE OBSTRICT ENGAGER.  CI, LOUSSYLE, CORPS, OF ENGAGERS, FEEGRAL  KY, FAMILIES OF THE CONTRACTOR TO AVAIL	SIS SIS	SALTSTONE SILTSTONE	80 - 8E00E0	OR BEDS DOED	D - CROSSBEDOWG	٠	
HMSELF OF THE INFORMAT LABORATORY TEST RESULT THE GOVERNMENT WITHELD	MASÉLF OF THE WORMATION REPRESENTED BY THE BORMS LOCS, WILLDOWS LABORATORY TEST RESULTS, SHALL NOT BE GROUNDS FOR A CLAMA THAI THE COVERNMENT WITHELD WORMATION ON SUBSURFACE CONDITIONS.	885		• • •	EOUS	٠		
7. THE TERM "LOST WATER". DRILLING WATER LOST IN	THE TERM "LOST WATER" AS SHOWN ON THE LOGS MOICATES A QUANTITY OF ORLING WATER LOST IN THE DRILL HOLE.	20 S		> ¥ &		•	_	
8. DRIVE SAMPLES WERE TAK SPOON SAMPLER USING A INDICATED ON GRAPHIC LO	DRIVE SAMPLES WERE TAKEN WITH A 1 3/8"LD2"O.D. X 2"-8"-SPLIT SPOON SAMPLER USING A 140" HAMMER WITH A 30"DROP, UNLESS OTHERWISE MINICATED ON GRAPHIC LOSS.	25 00 00 00 00 00 00 00 00 00 00 00 00 00	OURTIZ     ROCK OUALITY DESIGNATION     NODULES     CRAVELLY	GRUCA GRUCA	MCA STY 8/P	A · MCACEOUS  ' · STYLOLITIC  · · BEDOING PLANE	¥	
9. CORE HOLES WERE COMPL	CORE HOLES WERE COMPLETED BY AN INM OR NO WIRE LINE SIZE CORE BARREL	58			BEDDING PLANE			
WITH DIAMOND BIT, UNLESS	WITH DIAMOND BIT, UNLESS OTHERWISHONCATED ON THE GRAPHIC LOG. WATER CONTENT (WC) AS SHOWN ON GRAPHIC LOG REPRESENTS THE MOSTURE	18 J	SUGHTLY     MODERATELY     MFDIRM	CARBO - CARBONACI FREO - FREOLENT	ONACEOUS BOH	• • •	MOLE *	
	I DATE MADE. THE COMME I FOR IN THE ELEVATION AT THE	알 <b>모</b>		٠.	S.	• • •	ANGLEAR ROUNDS RAY DEFRACTION ANALYSIS	
	THE OF DRILLING, THE ELEVATION MAY HAVE CHANGED SINCE THAT THE.	NUM	• •	• •	FRACMENTS		L NOTE 11)	
12-OPTIMIM MOSTURE WAS O TESTS IN ACCORDANCE WI METHOD 100: RESPECTIVELY 13. THE LETTER DESIGNATION METHOD OF EXPLORATION	ODTIMUM MOSTURE WAS OBTAINED BY STANDARD PROCTOR OR CE 55 COMPACTION TESTS AN ACCORDANCE WITH EM 1110-2-1906, APP. VI OR ML. STD. 621 A METHOD NOT RESPECTIVELY, AN OTTED ON BORING LOG. THE LETTER DESIGNATION USED BEFORE BORING NUMBER NOTCATES THE METHOD OF EXPLORATION FOR EXAMPLE: DC-DRIVE SAMPLER AND CORE BORING.	TW TW			ONITE THE PROPERTY OF THE PROP			
DC-10 7-26-56—1-BORNG NO. B. DATE MADE 7-26-56—1-BORNG NO. B. DATE MADE 14. CENERAL-WOTES 5 AND 6 MAY NOT 15. PERFORMED BY OTHERS.  SPERFORMED BY OTHERS.	DC-10 7-26-56 - BORBUG NO. & DATE MADE 7-26-56 - BORBUG NO. & DATE MADE 18. DERFORMED BY OTHERS. S PERFORMED BY OTHERS. S S S S S S S S S S S S S S S S S S							
	CORRELATION OF PENETRATION RESISTANCE (ASTM D 1586) WITH	WITH	3M	WEATHERING		TERMS FOR THICKN	TERMS FOR THICKNESS OF ROCK BEDDING	Pa
rua	RELATIVE DENSITY AND CONSISTENCY		SEVERE WEATHERING	- LOSS OF ROCK COH	RANCE,	PARTING	₹ 0.02	age
PENETRATION RESISTANCE,N	RELATIVE DENSITY PENETRATION RESISTANCE, N Bloss on fool	NCE,N		BY HAND TOOLS, RETAINES SOME EVIDENCE OF	TANES	BAND	0.02:-0.2	30
ማ		Very Soft		ROCK STRUCTURE		THIN BED	0.2-0.5	2 c
20	4 · 4 CMA STEE	Soft	MODERATE WEATHERING	MATERIAL MAY BE OXIDIZED BUT MOST PHYSICAL CHARACTERISTIC	IDIZED BUT PACTERISTIC	MEDIUM BED	0.5-1.0	of 9
GRAVELS CUST - 50	CLAYS 9 .			REMAIN, OCCASIONAL BLOCKS MAY BE REMOVED WITH HAND TOOLS.	BLOCKS MAY AND TOOLS.	THICK BED	1.0-5.0	47
05 20 00	Very Dense 16 · 30	Very Still Hord	SLIGHT WEATHERING	MATERIAL GENERALLY FRESH, WITH VARIOUS DEGREES OF WEATHERING	FRESH, WITH F WEATHERING	MASSIVE	٧ 5.0	
				ALONG JOINTS AND	BEDDING.			

			-1								Page 303 of 9	<del>)47</del>
BORING NO.	B-1			SHE			1				DF 1	
1. PROJECT	Live Fire Shoothouse Facility								/ATIO			
2. LOCATION	N: 838769.25 E: 1480066.13			SHC	NN	ITE	И (ТЕ	BM C	OR MS	SL)	MSL	
3. DRILLING			7	11. [	DRIL	L ME	THO	D			3 1/4" 00 HSA	
4. NAME OF I	DRILLER Shawn Riley		$\dashv$	12. E	ELE	VATIO	T NC	OP (	OF HO	DLE	657.5'	
5. DRILL TYP	E		$\forall$	13. 7	ГОТ	AL N	UMB	ER (	CORE	BOXI	ES	
6. THICKNES	CME-550-X ATV S OF OVERBURDEN		$\dashv$	14. F	ELE	/ATIC	ON G	ROL	JND V	VATE		
	20.0'		$\dashv$	15. [	DAT	E HO	LE				N/A	
	N/A PTH OF BORING		-			STAR					COMPLETED	
	20.0' N OF BORING		$\dashv$	16 1	NSE	2/13 ECT	3/12 OR				2/13/12	
	CAL INCLINED			10.1	INOI		Smith	(KS	WA)			
			SS		/PE	NCH	%	NO				
ELEVATION	CLASSIFICATION OF MATERIALS	Ð	CLA	# 37	Ĺ	-9 / S/	TURE	TRAT	VER	%	REMARKS	
	OI WATERWES	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	RECOVERY	RQD		
657.5	TOPSOIL		CL	-	M	4						ŧ
657.3	Stiff, brown, lean CLAY, moist			1	М	7 10	16.7	1.5	1.5			F
_ _ _				2	M	5 6	26.5	1.5	1.5			E
					$\mathbb{A}$	7					_	F
												E
_				3	X	4 5	24.9	1.5	1.5			Ē
<u> </u>					H	6						Ē
<u>-</u>				4	M	3 4	24.7	1.5	1.5			E
_				Ľ	Δ	5	24.1	1.5	1.0			E
												Ė
	Stiff, light brown mottled, lean CLAY, moist		CL			2						E
				5	X	3 4 6	24.3	1.5	1.5			Ē
<u> </u>												Ē
<u>-</u>												Ē
<u>-</u>												E
<u>-</u>												E
643.5	Stiff, light brown and tan and gray mottled, lean CLAY, moist		CL		М	5			l		Plasticity increasing with depth	E
- - -				6	М	5 7	22.6	1.5	1.5			F
- - -												E
											   LL=44	E
											PL=20	E
					M	4					SG=2.8	E
<u>.                                    </u>		//		7	$\mathbb{N}$	4 7	27.1	1.5	1.5		No groundwater encountered during drilling	
	End of boring at 637.5 feet.										Bottom of hole at 20 feet.	Ē
_												Ē
<u> </u>												Ē
- - - -												E
												E
-												-

			- 1								Page 304 of 9	<del>)4</del> 7
BORING NO.	B-2		_	SHE			1				)F 1	
1. PROJECT	Live Fire Shoothouse Facility								/ATIO			
2. LOCATION	N: 838791.72 E: 1480198.42			SHC	ννN	IITEN	VI (TE	SM C	OR MS	sL)	MSL	
3. DRILLING	AGENCY KSWA/ Tri-State			11. [	DRIL	L ME	THC	D			3 1/4" 00 HSA	
4. NAME OF I	DRILLER Shawn Riley			12. I	ELE'	VATIO	ON T	OP (	OF HO	DLE	658.5'	
5. DRILL TYP				13.	ГОТ	AL N	UMB	ER (	CORE	вох		
6. THICKNES	S OF OVERBURDEN		_	14. I	ELE'	VATIO	ON G	ROL	JND V	VATE	R	
7. DEPTH DR	15.0'		$\dashv$	15. I	DAT	E HO	LE				N/A	
8. TOTAL DE	N/A PTH OF BORING		$\dashv$		S	STAR					COMPLETED	
9. DIRECTION	15.0' N OF BORING		$\dashv$	16. I	NSF	2/13 PECT	3/12 OR				2/13/12	
	CAL INCLINED					T. S	Smith	(KS	WA)	1	T	
ELEVATION	CLASSIFICATION		USCS CLASS	#	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	IR.		REMARKS	I V Co
	OF MATERIALS	LEGEND	SCS	SAMPLE #	4MPLI	-ows	OISTL	ENET	RECOVERY	RQD %		I I
- - 658.5	TOPSOIL	717/	ž	S)	\ /		Ž	2	~	ĕ		
000.0 _ _	10,0012	1/ 7		1	IXI	3 3 5	10.7	1.5	1.3			Ē
		11/	CL		$\langle \cdot \rangle$							Ē
656.9 	Firm to stiff, brown, lean CLAY, moist		02	2	IXI	3 3 6	23.8	1.5	1.3			F
_ _ _					H							E:
											LL=37 - PL=19	Ē.
				3	M	2	24 5	1.5	1.5		SG=2.73	Ė.
_ _ _				3	M	5	24.5	1.5	1.5			F
												Ė,
<u> </u>				4	M	3 5	23	1.5	1.5			E
					$\mathbb{N}$	5						E
												F
<del></del> <u>=</u> =		1/	CI									E
649.5 	Stiff, brown mottled, lean CLAY, moist		CL	5	M	4	23.5	1.5	1.5			E
					$\square$	9						F-1
<u>-</u> -												-1
 =												E_1:
												Ē
_ _ 												-1:
_ _ _				6	M	3 5	21.9	1.5	1.5		No groundwater encountered during	-1
				J	$\mathbb{N}$	6	21.7	1.5	1.0		drilling	1:
	End of boring at 643.5 feet.	,			_						Bottom of hole at 15 feet.	Ē
- - - -												-1
_ _ _												-1
												-1:
_ 												F-1
_ 												-1
_												-

											Page 305 of 947
BORING NO.	B-3			SHE			1				DF 1
1. PROJECT	Live Fire Shoothouse Facility								ATION		
2. LOCATION	N: 828806.36 E: 1480350.72			SHC	vviN	11 <b>⊏</b> I\	u (IB	IVI C	R MS	L)	MSL
3. DRILLING A	AGENCY KSWA/ Tri-State			11. [	DRIL	L ME	THO	D			3 1/4" 00 HSA
4. NAME OF D	ORILLER Shawn Riley			12. E	ELE\	/ATIC	ON TO	OP C	F HO	LE	657.5'
5. DRILL TYPE				13.	ГОТ	AL N	JMBE	ER C	ORE I	BOXE	
6. THICKNESS	S OF OVERBURDEN		7	14. E	ELE\	/ATIC	ON GI	ROU	ND W	ATER	!
7. DEPTH DRI	15.0' ILLED INTO ROCK		7	15. [	DATI	E HOI	LE				N/A
8. TOTAL DEF	N/A PTH OF BORING		$\dashv$		5	STAR					COMPLETED
9. DIRECTION	15.0'		$\dashv$	16. I	NSF	ECTO	3/12 OR				2/13/12
VERTIC	CAL NCLINED						Smith	(KS	VA)	1	
ELEVATION	CLASSIFICATION OF MATERIALS	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	RECOVERY	RQD %	REMARKS
657.5	TOPSOIL	1 1/2	CL	1	M	2 5	20.2		1.1		-
657.2 	Stiff, brown, lean CLAY, moist				$\langle \cdot \rangle$	6					
<u>=</u> = =				2	Д	4 6	25.7	1.5	1.3		
	Stiff, brown mottled, lean CLAY, moist		CL	3	M	3 5	22.6	1.5	1.5		<u> </u>
= = = = = =						7					LL=48 = PL=17
=- =- =- =- =-				4	X	3 5 6	25.6	1.5	1.5		SG=2.84
= = = =				5	M	3 5	25.5	1.5	1.5		
= = = = = =						7					
											E-1
	Hard, brown and tan, lean CLAY with chert, moist		CL	6	M	11 12 20	27	1.5	1.5		No groundwater encountered during
<u> </u>	End of boring at 642.5 feet.	/_/			VΝ	20					drilling1
= = = = = = = = = = = = = = = = = = =											Bottom of hole at 15 feet.
- - - - - -											E-1
											-2
<u> </u>											<u></u> 2
<u> </u>											Ē
_											-2

DODING NO.			- 1								Page 306 of	947
BORING NO. E	3-4			SHE			1				DF 1	
1. PROJECT L	Live Fire Shoothouse Facility								/ATIO			
2. LOCATION	V: 838703.63 E: 1480120.89			SHC	)VV N	IIIE	VI ( I E	SIVI C	OR MS	SL)	MSL	
3. DRILLING A	GENCY KSWA/ Tri-State			11. [	DRIL	L ME	ТНО	D			3 1/4" 00 HSA	
4. NAME OF D	RILLER Shawn Riley			12. E	ELE	VATIO	T NC	OP (	OF HO	DLE	659.0'	
5. DRILL TYPE			7	13.	ГОТ	AL N	UMB	ER (	ORE	BOXI	ES .	
6. THICKNESS	CME-550-X ATV S OF OVERBURDEN		7	14. E	ELE	/ATIC	ON G	ROL	JND V	VATE		
7. DEPTH DRI	20.0' LLED INTO ROCK		$\dashv$	15. [	DAT	E HO	LE				N/A	
8. TOTAL DEF	N/A PTH OF BORING		$\dashv$		5	STAR					COMPLETED	
9. DIRECTION	20.0'		+	16. I	NSF	2/13 ECT	3/12 OR				2/13/12	
	AL INCLINED					T. S	Smith	(KS	WA)		T	
			SS		TYPE	Š	%	NOL	<b> </b>			L
ELEVATION	CLASSIFICATION OF MATERIALS	S.	USCS CLASS	SAMPLE #	PLET	BLOWS / 6-INCH	MOISTURE %	PENETRATION	RECOVERY	%	REMARKS	0
		LEGEND	USC	SAM	SAMPLE	BLO\	MOIS	PEN	REC	RQD		L C C F
	TOPSOIL	177	CL	1	M	4	24.2	1.5	1.1			Ē
658.8 	Stiff, brown, lean CLAY, moist			Ľ.	A	6	24.2	1.0				E
_				2	IXI	4 5 6	24.6	1.5	1.5			E
					H	0						E
<u> </u>					H						_	E
_				3	X	3 4 6	23.1	1.5	1.5			E
<u> </u>		1/										Ē
= 653.0 =	Firm to stiff, brown mottled, lean CLAY, moist		CL	4	M	4	24.3	1.5	1.5		LL=47 PL=19	E
=					H	5					SG=2.76	E
=				_	М	3	04.4	4.5	4.5			
_				5	М	5 8	24.4	1.5	1.5			-1
_												<u>-</u> 1
<u> </u>												E
<u> </u>												<u>-</u> 1
<u> </u>		1/	CL								Disabilitation and the death	
645.0	Very stiff, tan and gray mottled, lean CLAY, moist		, OL		IXI	3 9 14	21.8	1.5	1.4		Plasticity increasing with depth	
=					H	14						E 1
												F
												<u>-</u>
— ≣∔		1/										<u>-</u> 1
<u></u> 640.5	Stiff, gray mottled, lean CLAY, moist		CL		X	6 9	18.4	1.5	1.5		No groundwater encountered during	-1
_	End of boring at 639 feet.	_\//			VΝ	8					drilling	2
_	· ·										Bottom of hole at 20 feet.	-2
_												-2
<u> </u>												-2
												E

e Fire Shoothouse Facility  838705.89 E: 1480438.13  ENCY KSWA/ Tri-State  LLER Shawn Riley  CME-550-X ATV  F OVERBURDEN  20.0'			SHO	DATU	UM F			ATION	ı	F 1
E: 1480438.13  ENCY KSWA/ Tri-State  LLER Shawn Riley  CME-550-X ATV  F OVERBURDEN			SHO							
CNCY KSWA/ Tri-State  LLER Shawn Riley  CME-550-X ATV  F OVERBURDEN		_		VVIN	II EIV	ווטו	ıvı U	CIVI / I		
CME-550-X ATV  F OVERBURDEN									L)	MSL
CME-550-X ATV  F OVERBURDEN			11. [	RIL	L ME	THOI	D			3 1/4" 00 HSA
CME-550-X ATV F OVERBURDEN		T	12. E	LEV	/ATIC	ON TO	OP C	F HOI	LE	658.5'
F OVERBURDEN			13. T	ОТА	AL N	JMBE	RC	ORE E	BOXE	S N/A
20.0	-		14. E	LEV	/ATIC	N GI	ROU	ND W	ATER	
ED INTO ROCK N/A		$\dagger$	15. E	ATE	E HO	LE				IVA
OF BORING		┪		S	STAR					COMPLETED 2/13/12
F BORING		$\forall$	16. II	NSP						2 10/12
✓ INCLINED □						mith		VA)		
CLASSIFICATION OF MATERIALS	LEGEND	USCS CLASS	SAMPLE#	SAMPLE TYPE	BLOWS / 6-INC	MOISTURE %	PENETRATION	RECOVERY	RQD %	REMARKS
PSOIL m to stiff, brown mottled, lean CLAY, moist	<u>111/4</u>	T CL	12	X	2 2 4	24.8	1.5	1.2		
			3	X	4 6 6	25.3	1.5	1.4		
			4	X	4 7 13	23.7	1.5	1.5		
			5	V	4 5	24.2	1.5	0.9		
				/\	5					
ff, brown and gray mottled, lean CLAY, moist		CL	6	X	3 5 7	22.6	1.5	1.5		
				/ \						
			7	X	6 9 14	23.5	1.5	1.5		
										LL=46 PL=20
			8	M	3 3 5	23.1	1.5	1.5		SG=2.87  No groundwater encountered during drilling
d of boring at 638.5 feet.	J/ /L		l	<u>v 1</u>			l	l	1	Bottom of hole at 20 feet.
e d	BORING  CLASSIFICATION OF MATERIALS  PSOIL It to stiff, brown mottled, lean CLAY, moist  If brown and gray mottled, lean CLAY, moist  Of boring at 638.5 feet.	EBORING INCLINED CLASSIFICATION OF MATERIALS  PSOIL To stiff, brown mottled, lean CLAY, moist  To boring at 638.5 feet.  202 PREVIOUS EDITIONS ARE OBSOLETE. PF	EBORING  CLASSIFICATION OF MATERIALS  PSOIL  Into stiff, brown mottled, lean CLAY, moist  CL  CL  CL  CL  CL  CL  CL  CL  CL  C	20.0'  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  CL 12  3  4  4  5  10 brown and gray mottled, lean CLAY, moist  CL 6  10 brown and gray mottled, lean CLAY, moist  CL 6	EBORING  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  PSOIL Into stiff, brown mottled, lean CLAY, moist  CL  Stiff, brown and gray mottled, lean CLAY, moist  Stiff, brown and gr	20.0°  BORING  Inclined   CLASSIFICATION OF MATERIALS  CLASSIFICATION OF M	20.0°  27.3/12  16. INSPECTOR  T. Smith  CLASSIFICATION OF MATERIALS  QUEEN ST. Smith  CLASSIFICATION OF MATERIALS  17. CL  12. V 2. 24.8  3. V 4. 7. 23.7  5. V 4. 24.2  16. INSPECTOR T. Smith  CLASSIFICATION OF MATERIALS  18. J.	20.0°  EBORING  NCLINED	20.0'  CLASSIFICATION OF MATERIALS  QUAD STORM STATEMENT STATEMEN	20.0°  2713/12  16. INSPECTOR T. Smith (KSWA)  CLASSIFICATION OF MATERIALS  280IL 10 stiff, brown motited, lean CLAY, moist  CT  CT  CT  CT  CT  CT  CT  CT  CT  C

			- 1								Page 308 of 9	<del>)4</del> /
BORING NO.	B-6			SHE			1				DF 1	
1. PROJECT	Live Fire Shoothouse Facility								ATION			
2. LOCATION	N: 838637 86 F: 1480253 98			SHC	OWN	ITEN	И (ТВ	МС	R MS	L)	MSL	
3. DRILLING A	AGENCY KSWA/ Tri-State			11. [	DRIL	L ME	THO	D			3 1/4" 00 HSA	
4. NAME OF D	ORILLER Shawn Riley			12. I	ELE	/ATIC	ON TO	OP C	F HO	LE	660.5'	
5. DRILL TYPE				13.	ГОТ	AL N	JMBE	ER C	ORE I	BOXE	S	
6. THICKNESS	CME-550-X ATV S OF OVERBURDEN		$\dashv$	14. I	ELE\	/ATIC	)N G	ROU	ND W	ATER		
7. DEPTH DRI	15.0' LLED INTO ROCK		$\dashv$	15. [	DAT	E HO	LE				N/A	
	N/A PTH OF BORING		$\dashv$		5	STAR					COMPLETED	
9. DIRECTION	15.0'		$\dashv$	16 1	NSE	2/13 ECTO	3/12 OR				2/13/12	
	AL   INCLINED			10. 1	INOI		Smith	(KS	NA)		T	
ELEVATION	CLASSIFICATION OF MATTERIALS	9	USCS CLASS	# 4	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	VERY		REMARKS	DEPTH SCALE
	OF MATERIALS	LEGEND	SSS	SAMPLE #	SAMPI	3LOW:	MOIST	ENE	RECOVERY	RQD %		OEPT
660.5	TOPSOIL	71 1/2	Т		\	3						+-0-
660.0	Firm to stiff, brown, lean CLAY, moist		CL	1	$\bigvee$	5 5 3	20.7	1.5	1.4			1
				2	X	5 7	24.9	1.5	1.2			_ 2
_												- 4
<u> </u>				3	M	3	24.2	1.5	1.5			5
					H	6						E
654.5	Stiff, brown mottled, lean CLAY, moist	1/	CL	4	M	3 4	24.1	1.5	1.5			<u> </u>
_					Δ	7	24.1	1.5	1.5			7
												8
 651.5	Stiff, brown mottled, lean CLAY some chert, moist	1/	CL		$\square$	3						9
				5	M	3 5 6	25.6	1.5	1.5			10
												11
												12
												_ 13
647.0	Stiff, brown and tan and gray mottled, lean CLAY with chert, black oxide	1/	CL		$\square$	6						-14
_	nodules, moist			6	M	8 8	24.2	1.5	1.5		No groundwater encountered during drilling	15
<u> </u>	End of boring at 645.5 feet.										Bottom of hole at 15 feet.	E
_												<u>-</u> 16
<u> </u>												—17 =
												18
												19
												-20
												21
_												
<u> </u>												E
<u> </u>												<u>24</u>
LRL FORM JUNE 2000	<b>11202</b> PREVIOUS EDITIONS ARE OBSOLETE. SYMBOLS: ▼ WATER LEVELS.	PI AT CC	<b>ROJ</b> DMP	IECT	Γ: ΟΝ	Li ▶ P⁄	ve F	ire S	Shoot OSS (	hous		.E NO. <b>3-6</b>

											Page 309 of 9	47
BORING NO.	B-7			SHE	ET		1			С	DF 1	
1. PROJECT	Live Fire Shoothouse Facility								ATION			
2. LOCATION	N: 838640.84 E: 1480348.73			SHO	VVN	IIEN	/I(IB	мО	R MS	L)	MSL	
3. DRILLING A	AGENCY KSWA/ Tri-State			11. [	DRIL	L ME	THO	D			3 1/4" 00 HSA	
4. NAME OF D	DRILLER Shawn Riley			12. E	ELE\	/ATIC	ON TO	OP C	F HO	LE	661.0'	
5. DRILL TYPE	E			13.	ГОТ	AL NI	JMBE	ER C	ORE I	BOXE	S S	
6. THICKNESS	CME-550-X ATV S OF OVERBURDEN		$\dashv$	14. E	ELE\	/ATIC	)N GI	ROU	ND W	ATER		
7. DEPTH DRI	20.0' ILLED INTO ROCK		+	15. [	DATI	E HO	LE				N/A	
	N/A PTH OF BORING		_			STAR	TED				COMPLETED	
9. DIRECTION	20.0'		$\dashv$	16 1	NSE	2/13 ECT	3/12				2/13/12	
	CAL NCLINED			10.1	INOF		Smith	(KS\	VA)			
			တ္တ		JE	NCH	%	NO				ш
ELEVATION	CLASSIFICATION OF MATERIALS	9	CLAS	# H	삠	-9 / S	URE	TRAT	VERY	%	REMARKS	0
	OI WATERIALS	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	RECOVERY	RQD %		I IV OO TEGIN
661.0	TOPSOIL	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	T		Ĭ,	4						E
660.6	Firm to stiff, brown mottled, lean CLAY, moist		CL	1	M	4	21.3	1.5	1.2			E
- - - -				2	M	3 4	25.6	1.5	1.4			E
<u>-</u>				L	H	5						F
- - -												E
				3	IXI	4 4 5	23.7	1.5	1.5			Ē
= = =						5						E
				4	M	3 4	23.7	1.5	1.5		LL=39 PL=20	Ē
					$\mathbb{N}$	7					SG=2.81	E
<u></u>												E
<u>-</u> -						3						F
<u></u>				5	M	5 7	23.4	1.5	1.5			-1
												E_1
												-1
												E -1
= = =												Ē
647.0	Stiff to very stiff, bown mottled, lean CLAY some chert, moist		CL	6	M	5 6	29.9	1.5	1.5			<u>-1</u>
				Ľ	Μ	11	20.0	1.0	1.0			-1
<u></u>												-1
<u> </u>												E <sub>1</sub>
<u>-</u> -												<u>-</u> 1
					М	4						E_1
		//		7	M	5 8	25.4	1.5	1.5		No groundwater encountered during drilling	<u></u>
=	End of boring at 641 feet.										Bottom of hole at 20 feet.	E
												<u>-2</u>
												-2
<u>-</u> -												-2
<u></u>												-2
_												

											Page 310 of 9	$\circ$
BORING NO.	B-8			SHE	ET		1			С	F 1	
1. PROJECT	Live Fire Shoothouse Facility								ATION			
2. LOCATION				SHC	WN	ITEN	II (TB	МО	R MS	L)	MSL	
3. DRILLING A				11. [	DRIL	L ME	THO	D			3 1/4" 00 HSA	
4. NAME OF D	ORILLER Shawn Riley			12. I	ELE	/ATIC	ON TO	OP C	F HO	E	658.5'	
5. DRILL TYPE	Ε			13.	ГОТ	AL NI	JMBE	R C	ORE E	BOXE	S	
6. THICKNESS	CME-550-X ATV S OF OVERBURDEN		+	14. I	ELEV	/ATIC	ON GI	ROU	ND W	ATER	N/A	
	20.0'		-	15 [	DAT	E HO	l F				N/A	
	N/A N/A PTH OF BORING			10. 1		STAR					COMPLETED	
	20.0'			40.1			3/12				2/13/12	
9. DIRECTION VERTIC	AL INCLINED			16. I	NSF	ECTO T. S	OR Smith	(KS\	NA)			
			SS		'PE	NCH	%	NO O				Ш
ELEVATION	CLASSIFICATION OF MATERIALS	9	CLAS	# H	LET	-9 / S/	TURE	TRAT	VER	%	REMARKS	SC
	OI WITERWEO	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	RECOVERY	ROD 9		DEPTH SCALE
658.5	TOPSOIL	- x\ 1 <sub>x</sub> \	T		V	4			<u> </u>			
658.2	Stiff, brown, lean CLAY, moist			1	$\triangle$	4 6	22.7	1.5	1.5			<u> </u>
				2	M	5 5	23.6	1.5	1.4			- 2
					H	5						E
	Stiff to very stiff, brown mottled, lean CLAY some chert, moist	- 4/-	CL									E 4
<u></u> 654.5 	Sun to very sun, brown motiled, lean CEAT some chert, moist			3	X	4 7 12	22.1	1.5	1.5			Ē.
												=
<u>=</u> _			]	4	M	4 6	22.5	1.5	1.5			E
					H	9						F 7
											LL=44 PL=21	- 8
						5					SG=2.72	- 9
				5	M	5 9	27.4	1.5	1.5			-10
												-1
			1									-12
<u> </u>												<u>-</u> 13
 		//										_ 
644.5	Very stiff, brown, lean CLAY with chert, moist		CL	6	M	6 10	25.4	1.5	1.5			E
<u> </u>					$\mathbb{A}$	10						-15
												-16
												-17
			1									18
				7	M	4 5	31.5	1.5	1.5		No groundwater encountered during	-19
<u> </u>		//		Ľ	$\triangle$	9	01.0	1.5	1.0		drilling	20
<u></u>	End of boring at 638.5 feet.										Bottom of hole at 20 feet.	-2
												E
												22
												-23
												-24
												E

			- 1								Page 311 of 947
BORING NO.	B-9			SHE			1				DF 1
1. PROJECT	Live Fire Shoothouse Facility								ATION R MS		
2. LOCATION	N: 838568.39 E: 1480339.06			SHC	VVIN	II EIV	1(10	IVI C	IK IVIS	L)	MSL
3. DRILLING A	AGENCY KSWA/ Tri-State		$\sqcap$	11. [	DRIL	L ME	THO	D			3 1/4" 00 HSA
4. NAME OF D	ORILLER Shawn Riley			12. I	ELE\	/ATIC	)N T	OP C	F HO	LE	662.5'
5. DRILL TYPE				13.	ГОТ	AL N	JMBE	RC	ORE I	BOXE	
6. THICKNESS	S OF OVERBURDEN 15.0'			14. I	ELE\	/ATIC	N G	ROU	ND W	ATER	
7. DEPTH DRI	ILLED INTO ROCK		$\dashv$	15. [	DAT	E HO	LE				N/A
8. TOTAL DEF	N/A PTH OF BORING				5	STAR 2/13					COMPLETED 2/13/12
9. DIRECTION			+	16. I	NSF	ECT					2/13/12
VERTIC	CAL NCLINED N	1		1			mith	(KS\	VA)		
ELEVATION	CLASSIFICATION OF MATERIALS	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	RECOVERY	RQD %	REMARKS
662.5	TOPSOIL	7/1/	Т	1	M	4 5	22.6	1.5	1		
661.7	Stiff, dark brown mottled, lean CLAY, moist		CL	Ŀ	$\wedge$	6	22.0	1.0	<u>'</u>		
<u> </u>				2	X	5 5 6	21.7	1.5	0.8		
<del>-</del>		1/	CL								LL=38
<u> </u>	Firm to stiff, brown, lean CLAY, moist			3	X	2 4 4	23.4	1.5	1.5		SG=2.66
				4	V	2 4	23.2	1.5	1.5		
<u> </u>			1			6					-
				5	V	3 5	24	1.5	1.5		
<u></u>			1		$\overline{A}$	5					-
<u></u>											
											=
= = = = =				6	X	5 5 6	23.7	1.5	1.5		No groundwater encountered during drilling
	End of boring at 647.5 feet.	<b>_</b> / /									Bottom of hole at 15 feet.
<u> </u>											<u> </u>
<u> </u>											<u> </u>
=											<u> </u>
=											
<u></u>											
_											-
											<u>-</u>
											<u>-</u>
											<u> </u>
											Ē
=											-
<u>=</u>											
LRL FORM JUNE 2000	PREVIOUS EDITIONS ARE OBSOLETE. SYMBOLS: YMATER LEVELS.	. PI AT CO	<b>ROJ</b> DMP	IECT	Γ: ON	Li ▶ P/	ve F	ire S	Shoot OSS C	hous OF DR	e Facility HOLE N ILL FLUID <b>B-9</b>

BORING NO. B-10  1. PROJECT Live Fire Shoothouse Facility  2. LOCATION N: 838568.38 E: 1480339.06  3. DRILLING AGENCY KSWA/ Tri-State  4. NAME OF DRILLER Shawn Riley  5. DRILL TYPE CME-550-X ATV  6. THICKNESS OF OVERBURDEN 8.0'  7. DEPTH DRILLED INTO ROCK N/A 8. TOTAL DEPTH OF BORING 9. DIRECTION OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  TOPSOIL Firm to stiff, brown mottled, lean CLAY, moist  CL End of boring at 651 feet.  End of boring at 651 feet.	VATION TE HOL START 2/13/ PECTO T. Sr HONING 12 4 5	(TBM THOD N TOF MBEF N GRO E E TED //12 DR mith (F	OF CO	HOL RE B	OXES	N/A
Live Fire Shoothouse Facility  2. LOCATION N: 838568.38 E: 1480339.06  3. DRILLING AGENCY KSWA/ Tri-State  4. NAME OF DRILLER Shawn Riley  5. DRILL TYPE CME-550-X ATV  6. THICKNESS OF OVERBURDEN 8.0'  7. DEPTH DRILLED INTO ROCK N/A 8. TOTAL DEPTH OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  C	VATION TE HOL START 2/13/ PECTO T. Sr HONING 12 4 5	(TBM THOD N TOF MBEF N GRO E E TED //12 DR mith (F	OF CO	HOL RE B	E OXES	3 1/4" 00 HSA 659.0' S N/A
2. LOCATION N: 838568.38 E: 1480339.06  3. DRILLING AGENCY KSWA/ Tri-State  4. NAME OF DRILLER Shawn Riley  5. DRILL TYPE CME-550-X ATV  6. THICKNESS OF OVERBURDEN 8.0'  7. DEPTH DRILLED INTO ROCK N/A  8. TOTAL DEPTH OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  CL	VATION  VATION  TE HOL  START  2/13/ PECTO  T. Sr  HONION  1/2  4/5  5	THOD N TOF MBEF N GRO E TED /12 PR mith (F	P OF R CO	HOL RE B	E OXES	3 1/4" 00 HSA 659.0' S N/A
3. DRILLING AGENCY KSWA/ Tri-State 4. NAME OF DRILLER Shawn Riley 5. DRILL TYPE CME-550-X ATV 6. THICKNESS OF OVERBURDEN 8.0' 7. DEPTH DRILLED INTO ROCK N/A 8. TOTAL DEPTH OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  DEPTH DRILLED INTO SUIT, brown mottled, lean CLAY, moist  CLASSIFICATION CLASSIFICATION OF MATERIALS  DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 16. INSI  17. DEPTH DRILLED INTO ROCK N/A 16. INSI  18. DAT  19. DAT  19. DAT  10. DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 16. INSI  17. DEPTH DRILLED INTO ROCK N/A 17. DEPTH DRILLED INTO ROCK N/A 18. TOTAL DEPTH OF BORING N/A 19. DAT  18. DAT  19. DAT  19. DAT  19. DAT  19. DAT  10. DEPTH DRILLED INTO ROCK N/A 15. DAT  16. INSI  17. DEPTH DRILLED INTO ROCK N/A 16. INSI  17. DEPTH DRILLED INTO ROCK N/A 16. INSI  18. DAT  19. DAT  19. DAT  19. DAT  19. DAT  10. D	VATION VATION TE HOL START 2/13/ PECTO T. Sr HON-9/SMOOI	N TOP  MBEF  N GRO  E  ED  /12  OR  mith (F	P OF	RE B	OXE	3 1/4" 00 HSA 659.0' S N/A
4. NAME OF DRILLER Shawn Riley  5. DRILL TYPE  CME-550-X ATV  6. THICKNESS OF OVERBURDEN 8.0'  7. DEPTH DRILLED INTO ROCK N/A  8. TOTAL DEPTH OF BORING 9. DIRECTION OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  SO S	TAL NU VATION TE HOL START 2/13/ PECTO T. Sr HUNITO SING 12 4 5	MBEF N GRO E ED /12 DR mith (F	OUN	RE B	OXE	659.0' S N/A
5. DRILL TYPE  CME-550-X ATV  6. THICKNESS OF OVERBURDEN  7. DEPTH DRILLED INTO ROCK  N/A  8. TOTAL DEPTH OF BORING  9. DIRECTION OF BORING  VERTICAL  INCLINED  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  ON TOPSOIL  Firm to stiff, brown mottled, lean CLAY, moist  CLASSIFICATION OF MATERIALS  ON TOPSOIL  AND TOPSOIL  CLASSIFICATION OF MATERIALS  ON	VATION TE HOLD START 2/13/PECTO T. Sr	E ED /12 PR mith (F	OUN		ATER	S N/A
6. THICKNESS OF OVERBURDEN 8.0'  7. DEPTH DRILLED INTO ROCK N/A  8. TOTAL DEPTH OF BORING 9. DIRECTION OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  Results  Graph of the control of the cont	PECTO T. Sr HONI-9/SMOTH	ED /12 DR mith (F		D WA		
8.0'  7. DEPTH DRILLED INTO ROCK N/A  8. TOTAL DEPTH OF BORING 9. DIRECTION OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  CLASSIFICATION OF MATERIALS  TOTAL DEPTH OF BORING 16. INSI  SOLUTION OF MATERIALS  TOTAL DEPTH O	START 2/13/PECTO T. Sr HONI-9/SMOJB 2 4 5	ED /12 PR mith (F	KSW			N/A
8. TOTAL DEPTH OF BORING  9. DIRECTION OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  SY TO SO TOPSOIL  G59.0  TOPSOIL  Firm to stiff, brown mottled, lean CLAY, moist  1  2  3  4	START 2/13/PECTO T. Sr HONI-9/SMOJB 2 4 5	ED /12 PR mith (F	KSW.			
9. DIRECTION OF BORING VERTICAL INCLINED  CLASSIFICATION OF MATERIALS  GELEVATION OF MATERIALS  TOPSOIL Firm to stiff, brown mottled, lean CLAY, moist  CL  G53.6  Stiff, brown, lean CLAY with weathered chert, moist  CL  4	T. HONI-9/SMODIA	PR mith (F	KSW.			COMPLETED
ELEVATION  CLASSIFICATION OF MATERIALS  QUAD STATE OF STA	T. Sr HONI-9/SMOTH 2 4 5	mith (Ł	KSW.			2/13/12
659.0  658.7  TOPSOIL  CL  1  2  37. T  CL  1  658.6  Stiff, brown mottled, lean CLAY, moist  CL  4	2 4 5	RE %	- 1	A)		
659.0 TOPSOIL 658.7 Firm to stiff, brown mottled, lean CLAY, moist  2  3  4	2 4 5	묎	Z			
659.0 TOPSOIL 658.7 Firm to stiff, brown mottled, lean CLAY, moist  2  3  4	2 4 5	.⊃	RA T	VERY	.0	REMARKS
659.0 TOPSOIL 658.7 Firm to stiff, brown mottled, lean CLAY, moist  2  3  4	2 4 5	AOIST	PENETRATION	RECOVERY	RQD %	
658.7 Firm to stiff, brown mottled, lean CLAY, moist  2  3  653.6 Stiff, brown, lean CLAY with weathered chert, moist  CL  4	5			ш.	ш.	
3 Stiff, brown, lean CLAY with weathered chert, moist CL	1 - 1	20.8	1.5	1.5		
3 Stiff, brown, lean CLAY with weathered chert, moist CL	5 5	24.2	1.5	1.3		
653.6 Stiff, brown, lean CLAY with weathered chert, moist	8		_			
653.6 Stiff, brown, lean CLAY with weathered chert, moist						
SSS.0 Suit, brown, real CEAT with weathered client, findst	2 5	25.7	1.5	1.5		
4	6					
End of boring at 651 feet.		27.8	1.5	1.5		No groundwater encountered during
	9					drilling
						Bottom of hole at 8 feet.
<u>-</u> -						
<u>=</u>						
=						
<u>-</u> -						
<u>=</u>						
<u> </u>						
<del></del>						
LRL FORM 1202 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT:						

											Page 313 c	of 947	
BORING NO.	B-11		4	SHE		11845	1	=1>	/AT!^		DF 2		
	Live Fire Shoothouse Facility								/ATIO DR M				
2. LOCATION	N: 939503 13 E: 1/90370 53						(				MSL		
3. DRILLING	AGENCY KSWA/ Tri-State						ETHO				3 1/4" 00 HSA		
4. NAME OF I	DRILLER Shawn Riley			12. ELEVATION TOP OF HOLE 662.5' 13. TOTAL NUMBER CORE BOXES									
5. DRILL TYP				13.	тот	AL N	IUMB	ER (	ORE	BOXI	ES N/A		
6. THICKNES	S OF OVERBURDEN 8.0'			14.	ELE'	VATIO	ON G	ROL	JND V	NATE	R N/A		
7. DEPTH DR	RILLED INTO ROCK N/A			15.	DAT	E HC	DLE						
8. TOTAL DE	PTH OF BORING 8.0'				5		RTED 3/12				COMPLETED 2/13/12		
	N OF BORING			16.	INSF	PECT	OR						
VERTIC	CAL INCLINED				Ī		Smith		WA)				
ELEVATION	CLASSIFICATION OF MATERIALS	LEGEND	USCS CLASS	SAMPLE #	SAMPLE TYPE	BLOWS / 6-INCH	MOISTURE %	PENETRATION	RECOVERY	RQD %	REMARKS	DEPTH SCALE	
662.5	TOPSOIL	7/1/X	Т		$\backslash /$	4						- 0-	
661.7	Firm to stiff, brown, lean CLAY, moist	//	CL	1	X	4 5	26.5	1.5	1.5			- 1	
			1		$\left( \cdot \right)$								
			1	2	IXI	3 5 5	26.1	1.5	1.1			<u> </u>	
					$\mathbb{Z}$	5						- 3	
	Firm, brown mottled, lean CLAY, moist	1	CL				$\vdash$				-	- 4	
				3	IXI	2	22.1	1.5	1.5			F _	
					$\mathbb{N}$	5						- 5 -	
											LL=34	- 6	
											PL=18	E	
				4	V	3 4	21.7	1.5	1.5		SG=2.83  No groundwater encountered during	<u> </u>	
					$\mathbb{N}$	7					drilling	8	
	Bottorfragfrageb684sefeet.										Bottom of hole at 8 feet.		
												9	
_												- - -	
E												—10 —	
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_												F-10	
E												17	
<u>-</u>												-	
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												- -20	
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_												21 - -	
												- 22	
_												Ė	
												-23	
												Ė	
												24 	
_													
LRL FORM JUNE 2000	<b>1 1202</b> PREVIOUS EDITIONS ARE OBSOLETE. SYMBOLS: ▼ WATER LEVELS	. <b>PI</b> AT C	ROJ OMF	ECT PLET	: ION	Liv ▶ P	ve Fi ARTI	re S AL L	hooth OSS	nouse OF DF	Facility H	OLE NO. <b>B-11</b>	

Page 314 of 947

Section: APPENDIX A

## **KEY TO SYMBOLS**

**Symbol Description** 

Strata symbols

Sampler symbols

Topsoil

SPT - Standard Penetration Test



**USCS Lean Clay** 

#### Notes:

- 1. Water was encountered at feet.
- 2. These logs are subject to the limitations, conclusions, and recommendations in this report.
- 3. Results of tests conducted on samples recovered are reported on the logs.

LRL FORM 1202 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT: Live Fire Shoothouse Facility
JUNE 2000 ▼ WATER LEVELS AT COMPLETION PARTIAL LOSS OF DRILL FLUID

HOLE NO.

## **Appendix D – Laboratory Testing**

Laboratory Procedures Moisture Content Atterberg Limits Grain Size Curves

## LABORATORY PROCEDURES

<u>Soil Classification</u>: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current situations. In the explorations, samples obtained during drilling operations are examined in the contractor's laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on the test boring records.

The classification system discussed above is primarily qualitative. A detailed soil classification requires two laboratory tests: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D2487). Each of these classification systems and the in-place physical soil properties provide an index for estimating the soil's behavior. The soil classification and physical properties determined are presented in this report.

#### **Soil Classification Tests**

Section: APPENDIX A

Atterberg Limits: Portions of the samples are taken for Atterberg limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D4318.

Grain Size Tests: Grain Size Tests are performed to determine the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D421 (dry preparation) or ASTM D2217 (wet preparation). The grain size distribution of soils coarser than a number 200 sieve (0.074 mm opening) is determined by passing the samples through a standard set of nested sieves. Materials passing the number 200 sieve are suspended in water and the grain size distribution calculated from the measured settlement rate. These tests are conducted in accordance with ASTM D422.

Moisture Content: The Moisture Content is determined according to ASTM D2216.

<u>Physical Soil Properties</u>: The in-place physical properties are described by the specific gravity, wet unit weight, moisture content, dry unit weight, void ratio, and percent saturation of the soil. The specific gravity and moisture content are determined according to ASTM D854 and D2216, respectively. The wet unit weight is found by obtaining a known volume of the soil and dividing the wet sample weight by the known volume. The dry unit weight, void ratio and percent saturation are calculated values.



### Engineering, Environmental & Information Services

## REPORT OF NATURAL MOISTURE CONTENT (ASTM D 2216)

Project Name: Ft. Campbell LFSH
Project Number: 100-11-0133

Equipment Used: 3kg Ohaus Scale, Metal Tare, Oven

Remarks:

Date Received: 2/14/2012

Sample ID	Comple	Toro Moight	Toro and Mat	Toro and Day	Motor Meicht	Dansont	Doolsot
Sample ID	Sample Depth	Tare Weight (grams)	Tare and Wet Soil Weight	Soil Weight	Water Weight	Percent	Pocket
	Deptil	(grains)	(grams)	(grams)	(grams)	Moisture	Pen. (TSF)
			(grains)	(grains)			(151)
B-1, SS-1	0.0 - 1.5	14.15	60.89	54.19	6.70	16.7	(200
B-1, SS-2	1.5 - 3.0	13.59	71.77	59.58	12.19	26.5	(##C)
B-1, SS-3	4.0 - 5.5	13.92	70.41	59.15	11.26	24.9	
B-1, SS-4	6.0 - 7.5	13.48	67.26	56.60	10.66	24.7	
B-1, SS-5	9.0 - 10.5	13.59	56.20	47.88	8.32	24.3	2440
B-1, SS-6	14.0 - 15.5	13.69	51.53	44.55	6.98	22.6	
B-1, SS-7	18.5 - 20.0	13.60	74.92	61.86	13.06	27.1	
B-2, SS-1	0.0 - 1.5	13.84	64.85	59.92	4.93	10.7	
B-2, SS-2	1.5 - 3.0	13.89	53.38	45.79	7.59	23.8	9446
B-2, SS-3	4.0 - 5.5	13.80	50.66	43.40	7.26	24.5	
B-2, SS-4	6.0 - 7.5	13.70	71.47	60.68	10.79	23.0	
B-2, SS-5	9.0 - 10.5	13.68	52.61	45.19	7.42	23.5	
B-2, SS-6	13.5 - 15.0	13.87	81.09	69.03	12.06	21.9	***
B-3, SS-1	0.0 - 1.5	13.62	83.78	72.01	11.77	20.2	
B-3, SS-2	1.5 - 3.0	13.81	57.44	48.52	8.92	25.7	
B-3, SS-3	4.0 - 5.5	13.83	64.43	55.10	9.33	22.6	
B-3, SS-4	6.0 - 7.5	13.86	65.94	55.33	10.61	25.6	s <del>ee</del> s
B-3, SS-5	9.0 - 10.5	13.86	59.93	50.57	9.36	25.5	122
B-3, SS-6	13.5 - 15.0	13.41	73.90	61.04	12.86	27.0	inte.
Tested By:			hmidt	Date:	2/17/20 <sup>-</sup>		
Reviewed By:		OBre	When	Date:	2/25/1	_	

K. S. Ware and Associates, LLC 54 Lindsley Avenue Nashville, Tennessee 37210



K.S. Ware & Associates, L.L.C. Engineering, Environmental & Information Services

## REPORT OF NATURAL MOISTURE CONTENT (ASTM D 2216)

Project Name:

Ft. Campbell LFSH

Project Number:

100-11-0133

Equipment Used:

3kg Ohaus Scale, Metal Tare, Oven

Remarks:

Date Received:

2/14/2012

Ossasla ID	0	T 10/-:-!-	T 138/-4	T	107.1. 107.1.1.		D .
Sample ID	Sample	Tare Weight	Tare and Wet		Water Weight	Percent	Pocke
	Depth	(grams)	Soil Weight	Soil Weight	(grams)	Moisture	Pen.
			(grams)	(grams)			(TSF)
B-4, SS-1	0.0 - 1.5	13.62	52.28	44.75	7.53	24.2	-
B-4, SS-2	1.5 - 3.0	13.69	70.55	59.34	11.21	24.6	-
B-4, SS-3	4.0 - 5.5	13.73	56.07	48.13	7.94	23.1	
B-4, SS-4	6.0 - 7.5	14.12	52.33	44.86	7.47	24.3	1975
B-4, SS-5	9.0 - 10.5	13.70	84.20	70.35	13.85	24.4	5 <del>575</del> 8
B-4, SS-6	14.0 - 15.5	13.66	72.10	61.65	10.45	21.8	1950
B-4, SS-7	18.5 - 20.0	13.66	76.97	67.11	9.86	18.4	(# <b>e</b> 2
B-5, SS-1	0.0 - 1.5	13.82	79.46	66.40	13.06	24.8	
B-5, SS-2	1.5 - 3.0	13.79	75.74	63.25	12.49	25.3	
B-5, SS-3	4.0 - 5.5	13.68	72.87	61.53	11.34	23.7	
B-5, SS-4	6.0 - 7.5	13.61	89.23	74.48	14.75	24.2	
B-5, SS-5	9.0 - 10.5	13.84	86.09	72.79	13.30	22.6	
B-5, SS-6	14.0 - 15.5	13.69	49.54	42.72	6.82	23.5	
B-5, SS-7	18.5 - 20.0	13.80	80.07	67.62	12.45	23.1	-
D.C. CC 4	0.0.45	42.00	75.05	04.70	40.55	00.7	
B-6, SS-1	0.0 - 1.5	13.68	75.25	64.70	10.55	20.7	
B-6, SS-2	1.5 - 3.0	13.56	74.91	62.68	12.23	24.9	***
B-6, SS-3	4.0 - 5.5	13.71	63.24	53.58	9.66	24.2	
B-6, SS-4	6.0 - 7.5	13.69	60.21	51.19	9.02	24.1	3,000
B-6, SS-5	9.0 - 10.5	12.87	82.63	68.39	14.24	25.6	
B-6, SS-6	13.05- 15.0	13.50	82.74	69.27	13.47	24.2	
Tested By:		Т Со	hmidt	Date:	2/17/20	12	
Reviewed By:	3	WArel		Date:	2/29/1		

K. S. Ware and Associates, LLC54 Lindsley AvenueNashville, Tennessee 37210



Engineering, Environmental & Information Services

## REPORT OF NATURAL MOISTURE CONTENT (ASTM D 2216)

Project Name:

Ft. Campbell LFSH

Project Number:

100-11-0133

Equipment Used:

3kg Ohaus Scale, Metal Tare, Oven

Remarks:

Date Received:

2/14/2012

Cample ID	Commis	Toro Weight	Tare and Wet	Tora and Day	Motor Meight	Doroont	Pocket
Sample ID	Sample	Tare Weight		,	Water Weight	Percent	
	Depth	(grams)	Soil Weight	Soil Weight	(grams)	Moisture	Pen.
			(grams)	(grams)			(TSF)
B-7, SS-1	0.0 - 1.5	13.95	72.36	62.09	10.27	21.3	
B-7, SS-2	1.5 - 3.0	13.69	73.75	61.51	12.24	25.6	
B-7, SS-3	4.0 - 5.5	13.78	69.32	58.68	10.64	23.7	(**)
B-7, SS-4	6.0 - 7.5	13.50	51.98	44.61	7.37	23.7	( <del>-17</del> )
B-7, SS-5	9.0 - 10.5	13.64	79.40	66.93	12.47	23.4	5-975
B-7, SS-6	14.0 - 15.5	13.32	68.94	56.15	12.79	29.9	
B-7, SS-7	18.5 - 20.0	13.67	67.91	56.92	10.99	25.4	
B-8, SS-1	0.0 - 1.5	13.34	64.49	55.04	9.45	22.7	
B-8, SS-2	1.5 - 3.0	13.57	87.63	73.51	14.12	23.6	
B-8, SS-3	4.0 - 5.5	13.82	53.47	46.29	7.18	22.1	124
B-8, SS-4	6.0 - 7.5	13.69	61.95	53.07	8.88	22.5	
B-8, SS-5	9.0 - 10.5	13.08	55.85	46.64	9.21	27.4	
B-8, SS-6	14.0 - 15.5	13.56	89.62	74.23	15.39	25.4	-
B-8, SS-7	18.5 - 20.0	13.72	83.77	66.98	16.79	31.5	
B-9, SS-1	0.0 - 1.5	13.85	82.92	70.17	12.75	22.6	
B-9, SS-2	1.5 - 3.0	13.64	73.06	62.47	10.59	21.7	
B-9, SS-3	4.0 - 5.5	13.86	76.75	64.83	11.92	23.4	
B-9, SS-4	6.0 - 7.5	13.77	73.68	62.39	11.29	23.2	. ee.
B-9, SS-5	9.0 - 10.5	14.21	53.52	45.90	7.62	24.0	***
B-9, SS-6	13.5 - 15.0	13.43	64.04	54.33	9.71	23.7	
Tested By:		T Sc	l hmįdt	Date:		12	
Reviewed By:			rellen	Date:	2/29/1		
toricwed by.		pa	The same	Dato.	0/24/1		

K. S. Ware and Associates, LLC 54 Lindsley Avenue Nashville, Tennessee 37210



## REPORT OF NATURAL MOISTURE CONTENT (ASTM D 2216)

Project Name:

Ft. Campbell LFSH

Project Number:

100-11-0133

Equipment Used:

3kg Ohaus Scale, Metal Tare, Oven

Remarks:

Date Received:

2/14/2012

Sample ID	Sample	Tare Weight	Tare and Wet	Tare and Dry	Water Weight		Pocket
	Depth	(grams)	Soil Weight	Soil Weight	(grams)	Moisture	Pen.
			(grams)	(grams)			(TSF)
B-10, SS-1	0.0 - 1.5	13.84	64.04	55.41	8.63	20.8	
B-10, SS-2	1.5 - 3.0	13.53	56.66	48.26	8.40	24.2	
B-10, SS-3	4.0 - 5.5	13.76	74.01	61.71	12.30	25.7	
B-10, SS-4	6.5 - 8.0	13.64	56.90	47.50	9.40	27.8	
B-10, SS-1	0.0 - 1.5	13.80	61.21	51.29	9.92	26.5	
B-10, SS-2	1.5 - 3.0	13.67	77.67	64.42	13.25	26.1	
B-10, SS-3	4.0 - 5.5	13.78	52.00	45.07	6.93	22.1	
B-10, SS-4	6.5 - 8.0	14.05	72.85	62.37	10.48	21.7	
				,			
Tested By:		T. Sc	hmidt	Date:	2/17/20		
Reviewed By:		JAN.	Her	Date:	2/29/1	<u> </u>	

K. S. Ware and Associates, LLC 54 Lindsley Avenue Nashville, Tennessee 37210



Engineering, Environmental & Information Services

### Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-1, SS-6 and SS-7

Project Number:

100-11-0133

Test Date:

2/21/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

Sample Description:

LEAN CLAY (CL), light brown, tan, and gray

Date Received:

2/14/2012

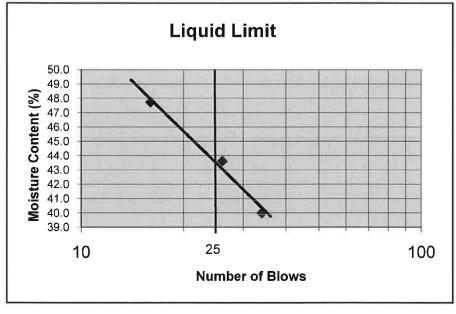
		Liquid	l Limit	Pla	astic Conter	nt
Tare No	1	2	3	4	5	
Wet Soil and Tare	19.82	20.65	19.41	20.40	20.25	
Dry Soil and Tare	18.08	18.60	17.61	19.32	19.08	
Wt. of Water	1.74	2.05	1.80	1.08	1.17	
Tare Wt.	13.73	13.90	13.84	13.64	13.41	
Dry Soil	4.35	4.70	3.77	5.68	5.67	
Moisture content%	40.0	43.6	47.7	19.0	20.6	
No. Of blows	34	26	16	Average:	20	

Required Blows

25-35

20-30

15-25



Liquid Limit:

44

20

Plastic Limit:

Plasticity Index: 24

**USCS CLASSIFICATION:** 

CL

Tested By:

T. Schmidt

Date:

2/21/2012

Reviewed By:

Date:

2/29/12

K. S. Ware and Associates, L.L.C.

54 Lindsley Ave

Nashville, TN 37210

Phone (615) 255-9702

Fax (615) 256-5873



Engineering, Environmental & Information Services

#### Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name: Ft. Campbell - LFSH Sample ID: B-2, SS-2 and SS-3

Project Number: 100-11-0133 Test Date: 2/20/2012

Equipment Used: LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

25-35

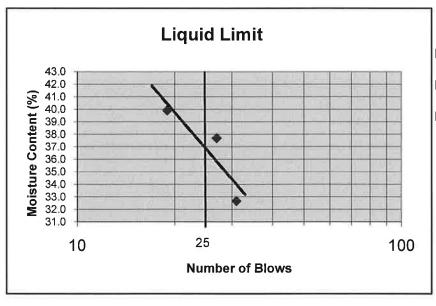
Sample Description: LEAN CLAY (CL), brown

Date Received: 2/14/2012

Required Blows

		Liquid	Limit	Plastic Content			
Tare No	1	2	3		4	5	
Wet Soil and Tare	19.64	19.54	19.22		20.13	20.28	
Dry Soil and Tare	18.21	17.98	17.64		19.11	19.22	
Wt. of Water	1.43	1.56	1.58		1.02	1.06	
Tare Wt.	13.83	13.84	13.68		13.76	13.78	
Dry Soil	4.38	4.14	3.96		5.35	5.44	
Moisture content%	32.6	37.7	39.9		19.1	19.5	
No. Of blows	31	27	19		Average:	19	

15-25



20-30

Liquid Limit: 37

Plastic Limit: 19

Plasticity Index: 18

**USCS CLASSIFICATION:** 

CL

 Tested By:
 T. Schmidt
 Date:
 2/20/2012

 Reviewed By:
 Date:
 2/25/12

K. S. Ware and Associates, L.L.C.

54 Lindsley Ave Nashville, TN 37210



## K.S. Ware & Associates, L.L.C.

Engineering, Environmental & Information Services

## Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-3, SS-3 and SS-4

Project Number:

100-11-0133

Test Date:

2/21/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

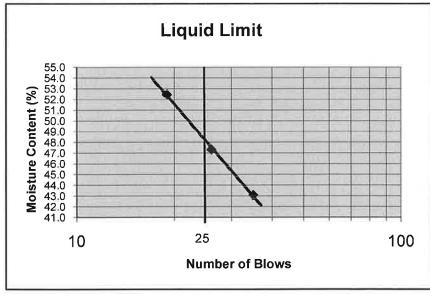
Sample Description:

LEAN CLAY (CL), brown

Date Received:

2/14/2012

		Liquic	l Limit		Pla	astic Conte	nt
Tare No	1	2	3		4	5	
Wet Soil and Tare	19.85	18.42	19.88	]	20.54	20.84	
Dry Soil and Tare	18.01	16.83	17.75	1	19.55	19.80	
Wt. of Water	1.84	1.59	2.13		0.99	1.04	
Tare Wt.	13.74	13.47	13.69		13.61	13.76	
Dry Soil	4.27	3.36	4.06		5.94	6.04	
Moisture content%	43.1	47.3	52.5		16.7	17.2	
No. Of blows	35	26	19		Average:	17	•
Required Blows	25-35	20-30	15-25				



Liquid Limit: 48

Plastic Limit: 17

**Plasticity Index:** 31

**USCS CLASSIFICATION:** 

CL

Tested By: Reviewed By: T. Schmidt

Date: Date:

2/21/2012 2/29/12

K. S. Ware and Associates, L.L.C.

54 Lindsley Ave Nashville, TN 37210 Phone (615) 255-9702



## K.S. Ware & Associates, L.L.C.

Engineering, Environmental & Information Services

## Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-4, SS-3 and SS-4

Project Number:

100-11-0133

Test Date:

2/20/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

Sample Description:

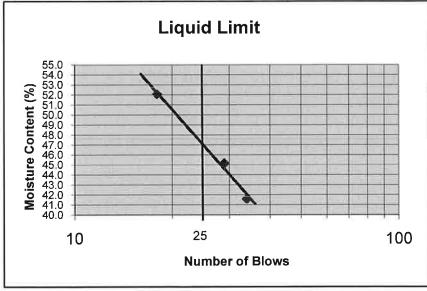
LEAN CLAY (CL), brown

Date Received:

2/14/2012

		Liquid Limit				Plastic Content		
Tare No	1	2	3		4	5		
Wet Soil and Tare	19.53	18.88	18.28		18.82	20.13		
Dry Soil and Tare	17.79	17.30	16.78		17.93	19.12		
Wt. of Water	1.74	1.58	1.50		0.89	1.01		
Tare Wt.	13.61	13.80	13.90		13.42	13.62		
Dry Soil	4.18	3.50	2.88		4.51	5.50		
Moisture content%	41.6	45.1	52.1		19.7	18.4		
No. Of blows	34	29	18		Average:	19		

Required Blows 25-35 20-30 15-25



Liquid Limit: 47

Plastic Limit: 19

Plasticity Index: 28

**USCS CLASSIFICATION:** 

CL

Tested By: Reviewed By: T. Schmidt

\_Date:

2/20/2012 2/29/12

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Nashville, TN 37210

Phone (615) 255-9702



## K.S. Ware & Associates, L.L.C.

Engineering, Environmental & Information Services

## Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-5, SS-6 and SS-7

Project Number:

100-11-0133

Test Date:

2/21/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

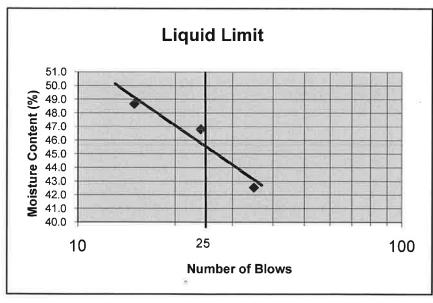
Sample Description:

LEAN CLAY (CL), brown and gray

Date Received:

2/14/2012

	-						
		Liquid	l Limit		Pla	astic Conte	nt
Tare No	1	2	3		4	5	
Wet Soil and Tare	19.66	18.79	19.24	1	20.05	19.88	
Dry Soil and Tare	18.03	17.10	17.40		18.94	18.81	
Wt. of Water	1.63	1.69	1.84		1.11	1.07	
Tare Wt.	14.20	13.49	13.62		13.32	13.31	
Dry Soil	3.83	3.61	3.78		5.62	5.50	
Moisture content%	42.6	46.8	48.7		19.8	19.5	
No. Of blows	35	24	15		Average:	20	)
Required Blows	25-35	20-30	15-25				



Liquid Limit: 46

Plastic Limit: 20

Plasticity Index: 26

**USCS CLASSIFICATION:** 

CL

Tested By:

T. Schmidt

Date: 2/21/2012

Reviewed By:

M Date:

2/29/12

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Phone (615) 255-9702



## K.S. Ware & Associates, L.L.C.

Engineering, Environmental & Information Services

## Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-7, SS-3 and SS-4

Project Number:

100-11-0133

Test Date:

2/21/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

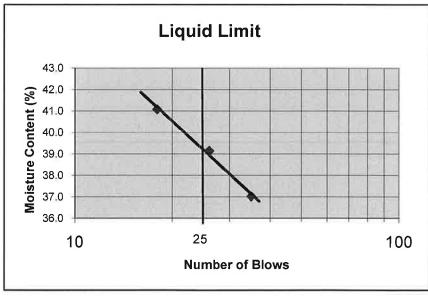
Sample Description:

LEAN CLAY (CL), brown

Date Received:

2/14/2012

		Liquie	Limit		DI	astic Conter
	1					astic Conten
Tare No	1	2	3		4	5
Wet Soil and Tare	18.15	20.47	18.85		19.39	19.51
Dry Soil and Tare	16.98	18.63	17.40		18.43	18.56
Wt. of Water	1.17	1.84	1.45		0.96	0.95
Tare Wt.	13.82	13.93	13.87		13.76	13.62
Dry Soil	3.16	4.70	3.53	Ī	4.67	4.94
Moisture content%	37.0	39.1	41.1	]	20.6	19.2
No. Of blows	35	26	18		Average:	20
Required Blows	25-35	20-30	15-25	*		



Liquid Limit: 39

Plastic Limit: 20

Plasticity Index: 19

**USCS CLASSIFICATION:** 

CL

Tested By:

T. Schmidt

Date:

2/21/2012

Reviewed By:

Date:

2/29/12

K. S. Ware and Associates, L.L.C.

54 Lindsley Ave

Nashville, TN 37210

Phone (615) 255-9702



## K.S. Ware & Associates, L.L.C.

Engineering, Environmental & Information Services

## Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-8, SS-4 and SS-5

Project Number:

100-11-0133

Test Date:

2/21/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

Sample Description:

LEAN CLAY (CL), brown

Date Received:

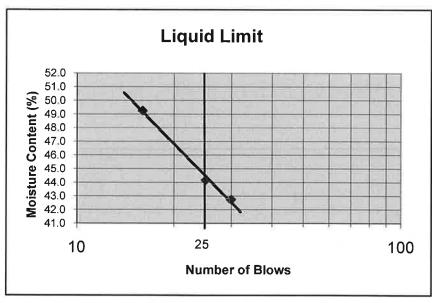
Required Blows

2/14/2012

25-35

		Liquid Limit				Plastic Content		
Tare No	1	2	3		4	5		
Wet Soil and Tare	19.07	19.71	18.55		19.41	19.15		
Dry Soil and Tare	17.42	17.89	16.89		18.35	18.22		
Wt. of Water	1.65	1.82	1.66		1.06	0.93		
Tare Wt.	13.56	13.77	13.52		13.26	13.71		
Dry Soil	3.86	4.12	3.37		5.09	4.51		
Moisture content%	42.7	44.2	49.3		20.8	20.6		
No. Of blows	30	25	16		Average:	21		

15-25



20-30

Liquid Limit: 44

Plastic Limit: 21

Plasticity Index: 23

**USCS CLASSIFICATION:** 

CL

Tested By:

T. Schmidt

Date: Date: 2/22/2012

Reviewed By:

2/29/12

K. S. Ware and Associates, L.L.C.

54 Lindsley Ave Nashville, TN 37210



## K.S. Ware & Associates, L.L.C.

Engineering, Environmental & Information Services

## Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-9, SS-2 and SS-3

Project Number:

100-11-0133

Test Date:

2/21/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

Sample Description:

LEAN CLAY (CL), dark brown

Date Received:

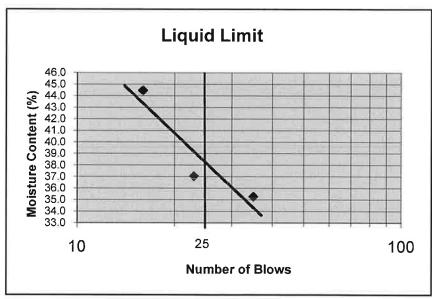
Required Blows

2/14/2012

25-35

		Liquid Limit			Pla	astic Conter
Tare No	1	2	3		4	5
Wet Soil and Tare	19.51	18.36	19.14		23.52	19.90
Dry Soil and Tare	18.00	17.07	17.49		22.45	18.86
Wt. of Water	1.51	1.29	1.65		1.07	1.04
Tare Wt.	13.72	13.59	13.78		16.38	13.11
Dry Soil	4.28	3.48	3.71		6.07	5.75
Moisture content%	35.3	37.1	44.5		17.6	18.1
No. Of blows	35	23	16		Average:	18

15-25



20-30

Liquid Limit: 38

Plastic Limit: 18

Plasticity Index: 20

**USCS CLASSIFICATION:** 

CL

Tested By:

T. Schmidt

Date:

2/21/2012

Reviewed By:

hem Date:

2/29/12

K. S. Ware and Associates, L.L.C.

54 Lindsley Ave Nashville, TN 37210



## K.S. Ware & Associates, L.L.C.

Engineering, Environmental & Information Services

## Report of Liquid Limit, Plastic Limit & Plasticity Index ASTM D4318

Project Name:

Ft. Campbell - LFSH

Sample ID:

B-11, SS-3 and SS-4

Project Number:

100-11-0133

Test Date:

2/21/2012

Equipment Used:

LLD, Oven, Ohaus 3kg Scale, Metal Tares, Mortar and Pestel, Spatula, Grooving

Tool

Sample Description:

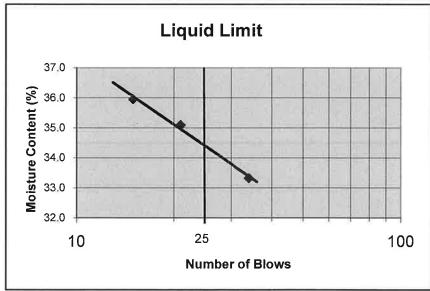
LEAN CLAY (CL), brown

Date Received:

2/14/2012

		Liquid Limit				Plastic Content		
Tare No	-1	2	3		4	5		
Wet Soil and Tare	19.28	18.99	19.40	1	19.37	20.50		
Dry Soil and Tare	17.88	17.60	17.89		18.50	19.41		
Wt. of Water	1.40	1.39	1.51		0.87	1.09		
Tare Wt.	13.68	13.64	13.69		13.62	13.47		
Dry Soil	4.20	3.96	4.20		4.88	5.94		
Moisture content%	33.3	35.1	36.0		17.8	18.4		
No. Of blows	34	21	15		Average:	18	8	

Required Blows 25-35 20-30 15-25



Liquid Limit: 34

Plastic Limit: 18

Plasticity Index: 16

**USCS CLASSIFICATION:** 

CL

Tested By: Reviewed By: T. Schmidt

ew

-Date:

2/21/2012

K. S. Ware and Associates, L.L.C.

54 Lindsley Ave Nashville, TN 37210



## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

Project Name:

Ft. Campbell - LFSH

**Project Number:** 

100-11-0133

Sample Location:

SS-6 and SS-7

Sample Number:

B-1

Depth:

14.0'-20.0'

Date Received:

2/14/2012

Soil Description:

LEAN CLAY (CL), light brown, tan, and gray

#### CONSTANTS:

Hydrometer Type:

151H

Dispersing Agent:

Sodium Hexa Meta Phosphate

Zero Correction:

0.003

Specific Gravity Of Solids:

2.80

Meniscus:

0.003

Center or Gravity Constant (cm):

19.84

Viscosity of Water @ 70°F:

0.00001

Hygroscopic Moisture (%):

1.3%

### Sieve Analysis to #10:

Total Air Dry Sample (grams):

60.49

9			
Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)
(mm)	(Grams)	Retained (Grams)	
38.1 mm	0	0	100.0
25 mm	0	0	100.0
19.1mm	0	0	100.0
9.51mm	0	0	100.0
4.75mm	0	0	100.0
2.0mm	0	0	100.0
N/A	60.49	60.49	
	Diameter (mm) 38.1 mm 25 mm 19.1mm 9.51mm 4.75mm 2.0mm	Diameter (mm)         Mass Retained (Grams)           38.1 mm         0           25 mm         0           19.1mm         0           9.51mm         0           4.75mm         0           2.0mm         0	Diameter (mm)         Mass Retained (Grams)         Cumulative Mass Retained (Grams)           38.1 mm         0         0           25 mm         0         0           19.1mm         0         0           9.51mm         0         0           4.75mm         0         0           2.0mm         0         0

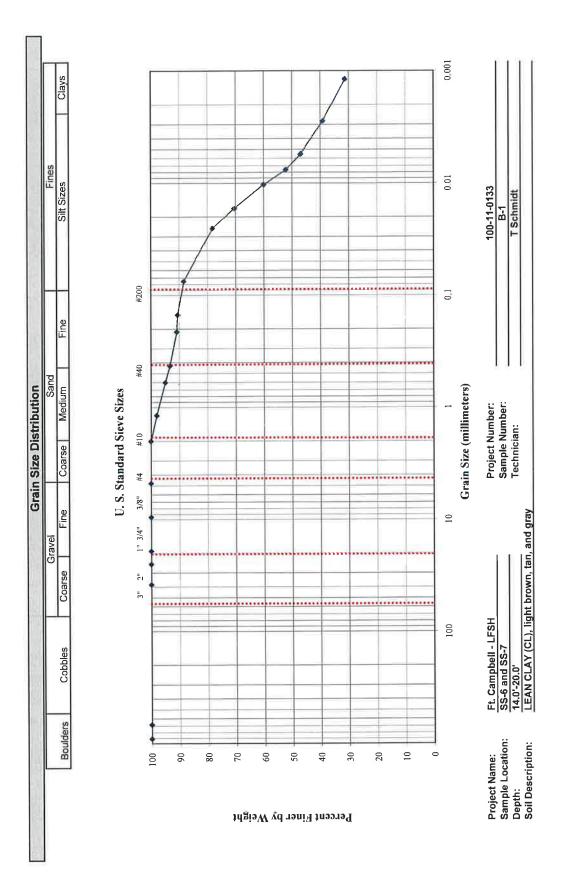
\*Percent Passing is adjusted for Hydroscopic Moisture

### Hydrometer Readings

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	К	D.mm
2	20.5	1.033	1.030	78.1437	78.1437	7.6	3.8000	0.01299	0.0253
5	20.7	1.030	1.027	70.3293	70.3293	8.4	1.6800	0.01296	0.0168
15	20.6	1.026	1.023	59.9102	59.9102	9.4	0.6267	0.01297	0.0103
30	20.6	1.023	1.020	52.0958	52.0958	10.2	0.3400	0.01297	0.0076
60	20.5	1.021	1.018	46.8862	46.8862	10.7	0.1783	0.01299	0.0055
250	20.8	1.018	1.015	39.0718	39.0718	11.5	0.0460	0.01294	0.0028
1440	21.6	1.015	1.012	31.2575	31.2575	12.3	0.0085	0.01282	0.0012

Sieve #	Diameter (mm)	Mass Retained (Grams)	Percent Passing (%)
	(11111)	(Orallis)	
16	1.18mm	1.24	97.92
30	0.6mm	3.09	94.83
40	0.425mm	4.06	93.20
70	0.212mm	5.50	90.79
100	0.150mm	5.74	90.39
200	0.08mm	6.95	88.36





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## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

Project Name: Ft. Campbell - LFSH Project Number: 100-11-0133

Sample Location: SS-2 and SS-3 Sample Number: B-2
Depth: 1.5'-5.5' Date Received: 2/14/2012

Soil Description: LEAN CLAY (CL), brown

#### CONSTANTS:

Hydrometer Type: 151H Dispersing Agent: Sodium Hexa Meta Phosphate

Zero Correction: 0.003 Specific Gravity Of Solids: 2.73

Meniscus: 0.001 Center or Gravity Constant (cm): 19.84

Viscosity of Water @ 70°F: 0.00001 Hygroscopic Moisture (%): 2.4%

### Sieve Analysis to #10:

Total Air Dry Sample (grams): 69.43

ry Campic	9.011.07.	00.70		
Sieve #	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)
	(mm)	(Grams)	Retained (Grams)	
1.5 in.	38.1 mm	0	0	100.0
1 in.	25 mm	0	0	100.0
3/4 in.	19.1mm	0	0	100.0
3/8 in.	9.51mm	0	0	100.0
#4	4.75mm	0	0	100.0
#10	2.0mm	0	0	100.0
Pan	N/A	69.43	69.43	

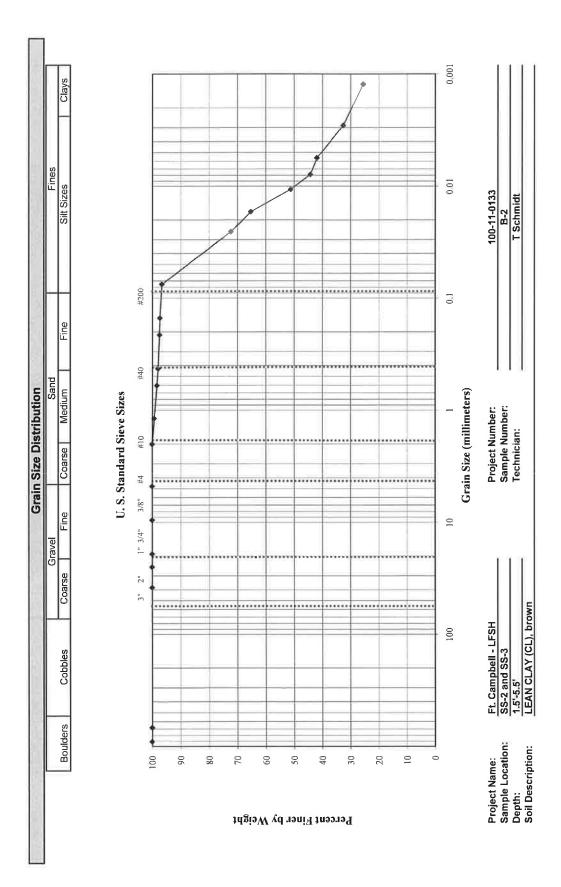
\*Percent Passing is adjusted for Hydroscopic Moisture

#### Hydrometer Readings

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	К	D.mm
2	20.6	1.034	1.031	72.1861	72.1861	7.3	3.6500	0.01322	0.0253
5	20.6	1.031	1.028	65.2004	65.2004	8.1	1.6200	0.01322	0.0168
15	20.6	1.025	1.022	51.2288	51.2288	9.7	0.6467	0.01322	0.0106
30	20.6	1.022	1.019	44.2431	44.2431	10.5	0.3500	0.01322	0.0078
60	20.6	1.021	1.018	41.9145	41.9145	10.7	0.1783	0.01322	0.0056
250	21.0	1.017	1.014	32.6002	32.6002	11.8	0.0472	0.01316	0.0029
1440	20.9	1.014	1.011	25.6144	25.6144	12.6	0.0088	0.01318	0.0012

Sieve #	Diameter	Mass Retained	Percent Passing (%)
	(mm)	(Grams)	
16	1.18mm	0.49	99.28
30	0.6mm	1.14	98.32
40	0.425mm	1.42	97.90
70	0.212mm	1.76	97.40
100	0.150mm	1.85	97.27
200	0.08mm	2.32	96.58





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## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

Project Name:

Ft. Campbell - LFSH

**Project Number:** 

100-11-0133

Sample Location:

SS-3 and SS-4

Sample Number:

B-3

Depth:

4.0'-7.5'

Date Received:

2/14/2012

Soil Description:

LEAN CLAY (CL), brown

#### CONSTANTS:

Hydrometer Type:

151H

Dispersing Agent:

Sodium Hexa Meta Phosphate

Zero Correction:

0.003

Specific Gravity Of Solids:

2.84

Meniscus:

0.001

Center or Gravity Constant (cm):

19.84

Viscosity of Water @ 70°F;

0.00001

Hygroscopic Moisture (%):

1.3%

## Sieve Analysis to #10;

Total Air Dry Sample (grams):

64.70

10	Campic (	grainey.				
Γ	Sieve #	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)	
L		(mm)	(Grams)	Retained (Grams)		
ľ	1.5 in.	38.1 mm	0	0	100.0	
	1 in. 25 mm		0	0	100.0	
	3/4 in.	19.1mm	0	0	100.0 100.0	
	3/8 in.	9.51mm	0	0		
	#4 4.75mm #10 2.0mm Pan N/A		0	0	100.0	
			0	0	100.0	
			64.7	64.7		

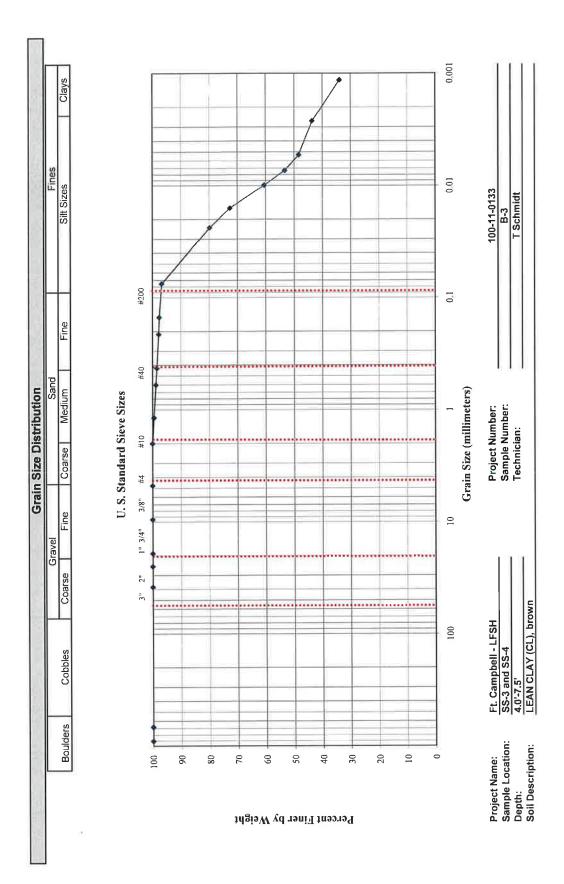
<sup>\*</sup>Percent Passing is adjusted for Hydroscopic Moisture

## Hydrometer Readings

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	к	D.mm
2	20.4	1.036	1.033	79.7869	79.7869	6.8	3.4000	0.01286	0.0237
5	20.3	1.033	1.030	72.5336	72.5336	7.6	1.5200	0.01288	0.0159
15	20.4	1.028	1.025	60.4446	60.4446	8.9	0.5933	0.01286	0.0099
30	20.4	1.025	1.022	53.1913	53.1913	9.7	0.3233	0.01286	0.0073
60	20.3	1.023	1.020	48.3557	48.3557	10.2	0.1700	0.01288	0.0053
250	20.6	1.021	1.018	43.5201	43.5201	10.7	0.0428	0.01283	0.0027
1440	21.6	1.017	1.014	33.8490	33.8490	11.8	0.0082	0.01268	0.0011

Sieve #	Diameter (mm)	Mass Retained (Grams)	Percent Passing (%)
16	1.18mm	0.35	99.45
30	0.6mm	0.79	98.76
40	0.425mm	1.00	98.43
70	0.212mm	1.45	97.73
100	0.150mm	1.56	97.56
200	0.08mm	2.14	96.65





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## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

**Project Name:** 

Ft. Campbell - LFSH

**Project Number:** 

100-11-0133

Sample Location:

SS-3 and SS-4

Sample Number:

**B-4** 

Depth:

4.0'-7.5'

**Date Received:** 

2/14/2012

Soil Description:

LEAN CLAY (CL), brown

#### CONSTANTS:

Hydrometer Type:

151H

Dispersing Agent:

Sodium Hexa Meta Phosphate

Zero Correction:

0.003

Specific Gravity Of Solids: Center or Gravity Constant (cm):

2.76 19.84

Meniscus:

0.001

Viscosity of Water @ 70°F:

0.00001

Hygroscopic Moisture (%):

1.2%

## Sieve Analysis to #10:

Total Air Dry Sample (grams):

68.07

-	y campic (	granio,	00.01			
	Sieve #	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)	
		(mm)	(Grams)	Retained (Grams)		
Ì	1.5 in.	38.1 mm	0	0	100.0	
ı	1 in. 25 mm		0	0	100.0	
Į	3/4 in.	19.1mm	0	0	100.0	
Į	3/8 in.	9.51mm	0	0	100.0	
Ì	#4	4.75mm	0	0	100.0	
	#10 2.0mm		0	0	100.0	
	Pan	N/A	68.07	68.07		

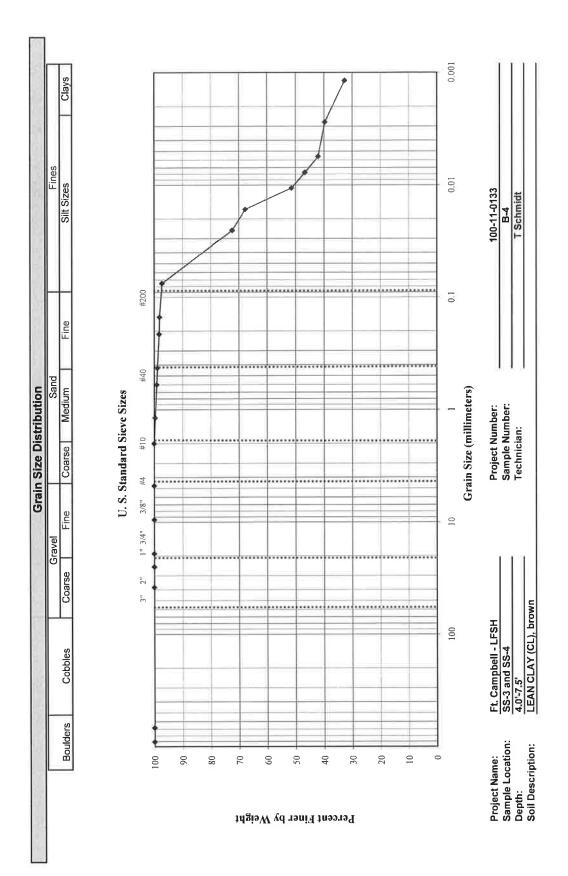
\*Percent Passing is adjusted for Hydroscopic Moisture

## **Hydrometer Readings**

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	К	D.mm
2	20.0	1.034	1.031	72.2920	72.2920	7.3	3.6500	0.01321	0.0252
5	20.0	1.032	1.029	67.6280	67.6280	7.8	1.5600	0.01321	0.0165
15	20.0	1.025	1.022	51.3040	51.3040	9.7	0.6467	0.01321	0.0106
30	20.0	1.023	1.020	46.6400	46.6400	10.2	0.3400	0.01321	0.0077
60	20.2	1.021	1.018	41.9760	41.9760	10.7	0.1783	0.01318	0.0056
250	20.8	1.020	1.017	39.6440	39.6440	11	0.0440	0.01308	0.0027
1440	21.3	1.017	1.014	32.6480	32.6480	11.8	0.0082	0.01301	0.0012

Sieve #	Diameter (mm)	Mass Retained (Grams)	Percent Passing (%)
16	1.18mm	0.25	99.63
30	0.6mm	0.63	99.06
40	0.425mm	0.78	98.84
70	0.212mm	1.19	98.23
100	0.150mm	1.29	98.08
200	0.08mm	1.88	97.20





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Page 338 of 947



## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

**Project Name:** 

Ft. Campbell - LFSH

**Project Number:** 

100-11-0133

Sample Location:

SS-6 and SS-7

Sample Number:

B-5

Depth:

14.0'-20.0'

Date Received:

2/14/2012

Soil Description:

LEAN CLAY (CL), brown

#### CONSTANTS:

Hydrometer Type:

151H

Dispersing Agent:

Sodium Hexa Meta Phosphate

Zero Correction:

0.003

Specific Gravity Of Solids: Center or Gravity Constant (cm):

2.87 19.84

Meniscus:

0.001

Viscosity of Water @ 70°F:

0.00001

Hygroscopic Moisture (%):

2.9%

## Sieve Analysis to #10:

Total Air Dry Sample (grams):

61.57

-	1 11	grantoji				
Siev	e#	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)	
		(mm)	(Grams)	Retained (Grams)		
1.5	in.	38.1 mm	0	0	100.0	
1 ir	1 in. 25 mm		0	0	100.0	
3/4	in.	19.1mm	0	0	100.0	
3/8	in.	9.51mm	0	0	100.0	
#4	1	4.75mm	0	0	100.0	
#1	#10 2.0mm		0	0	100.0	
Pa	n	N/A	61.57	61.57		

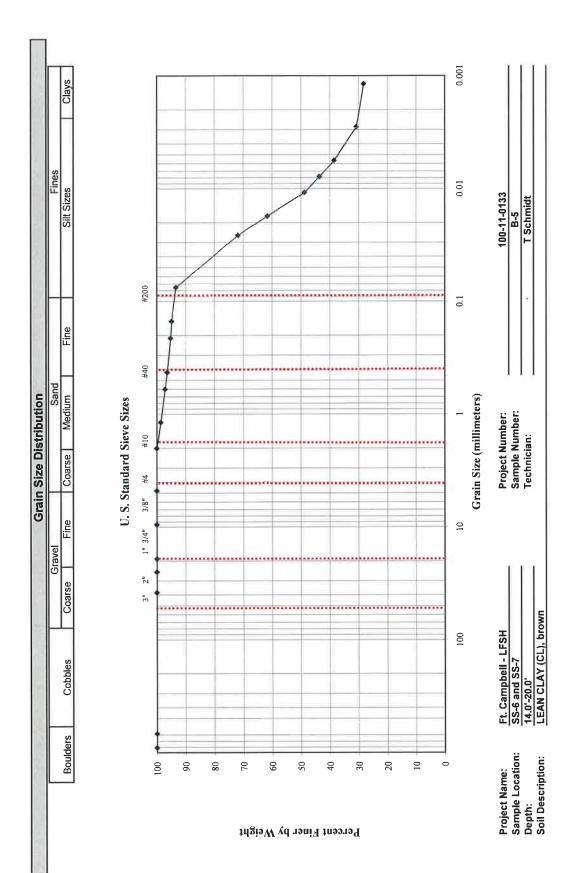
\*Percent Passing is adjusted for Hydroscopic Moisture

### **Hydrometer Readings**

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	К	D.mm
2	20.0	1.031	1.028	71.8452	71.8452	8.1	4.0500	0.01289	0.0259
5	20.0	1.027	1.024	61.5816	61.5816	9.2	1.8400	0.01289	0.0175
15	20.0	1.022	1.019	48.7521	48.7521	10.5	0.7000	0.01289	0.0108
30	20.2	1.020	1.017	43.6203	43.6203	11	0.3667	0.01286	0.0078
60	20.2	1.018	1.015	38.4885	38.4885	11.5	0.1917	0.01286	0.0056
250	20.8	1.015	1.012	30.7908	30.7908	12.3	0.0492	0.01276	0.0028
1440	21.4	1.014	1.011	28.2249	28.2249	12.6	0.0088	0.01267	0.0012

Sieve #	Diameter (mm)	Mass Retained (Grams)	Percent Passing (%)
16	1.18mm	0.83	98.61
30	0.6mm	1.74	97.09
40	0.425mm	2.16	96.39
70	0.212mm	2.87	95.20
100	0.150mm	3.09	94.83
200	0.08mm	3.97	93.36





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Page 340 of 947



## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

**Project Name:** 

Ft. Campbell - LFSH

**Project Number:** 

100-11-0133

Sample Location:

SS-3 and SS-4

Sample Number:

**B-7** 

Depth:

4.0'-7.5'

**Date Received:** 

2/14/2012

**Soil Description:** 

LEAN CLAY (CL), brown and gray

## CONSTANTS:

Hydrometer Type:

151H

Dispersing Agent:

Sodium Hexa Meta Phosphate

Zero Correction:

0.003

Specific Gravity Of Solids: Center or Gravity Constant (cm):

2.81 19.84

Meniscus:

0.001

Viscosity of Water @ 70°F:

0.00001

Hygroscopic Moisture (%):

1.9%

## Sieve Analysis to #10:

Total Air Dry Sample (grams):

60.29

′'	oampic (	granis).	00.20			
Γ	Sieve #	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)	
ı		(mm)	(Grams)	Retained (Grams)		
ľ	1.5 in.	38.1 mm	0	0	100.0	
Ī	1 in. 25 mm		0	0	100.0	
I	3/4 in.	19.1mm	0	0	100.0	
I	3/8 in.	9.51mm	0	0	100.0	
r	#4	4.75mm	0	0	100.0	
Ī	#10 2.0mm Pan N/A		0	0	100.0	
ſ			60.29	60.29		

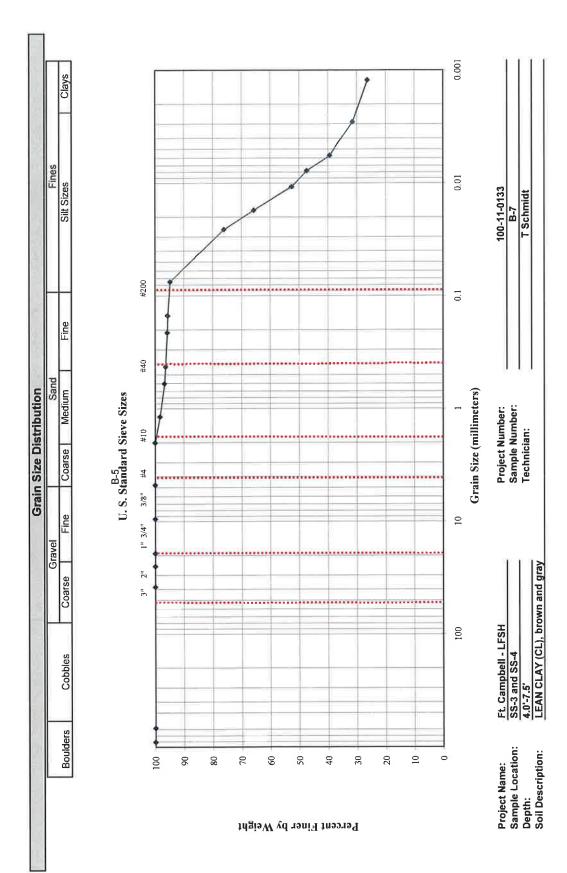
<sup>\*</sup>Percent Passing is adjusted for Hydroscopic Moisture

## Hydrometer Readings

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	К	D.mm
2	20.0	1.032	1.029	76.1364	76.1364	7.8	3.9000	0.01303	0.0257
5	20.0	1.028	1.025	65.6348	65.6348	8.9	1.7800	0.01303	0.0174
15	20.0	1.023	1.020	52.5078	52.5078	10.2	0.6800	0.01303	0.0107
30	20.3	1.021	1.018	47.2570	47.2570	10.7	0.3567	0.01299	0.0078
60	20.3	1.018	1.015	39.3809	39.3809	11.5	0.1917	0.01299	0.0057
250	20.9	1.015	1.012	31.5047	31.5047	12.3	0.0492	0.01289	0.0029
1440	20.8	1.013	1.010	26.2539	26.2539	12.9	0.0090	0.01291	0.0012

Sieve #	Diameter (mm)	Mass Retained (Grams)	Percent Passing (%)
16	1.18mm	0.99	98.33
30	0.6mm	1.93	96.74
40	0.425mm	2.13	96.40
70	0.212mm	2.49	95.79
100	0.150mm	2.60	95.60
200	0.08mm	3.08	94.79





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## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

Project Name: Ft. Campbell - LFSH Project Number: 100-11-0133

Sample Location: SS-4 and SS-5 Sample Number: B-8

Sample Location: SS-4 and SS-5 Sample Number: B-8
Depth: 6.0'-10.5' Date Received: 2/14/2012

Soil Description: LEAN CLAY (CL), brown

#### CONSTANTS:

Hydrometer Type: 151H Dispersing Agent: Sodium Hexa Meta Phosphate

Zero Correction: 0.003 Specific Gravity Of Solids: 2.72 Meniscus: 0.001 Center or Gravity Constant (cm): 19.84 Viscosity of Water @ 70°F: 0.00001 Hygroscopic Moisture (%): 2.2%

### Sieve Analysis to #10:

Total Air Dry Sample (grams): 63.03

, y	Carribic (	graino).	00.00		
Г	Sieve #	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)
L		(mm)	(Grams)	Retained (Grams)	
Г	1.5 in.	38.1 mm	0	0	100.0
Г	1 in.	25 mm	0	0	100.0
Г	3/4 in.	19.1mm	0	0	100.0
Г	3/8 in.	9.51mm	0	0	100.0
Г	#4	4.75mm	0	0	100.0
Г	#10	2.0mm	0	0	100.0
	Pan	N/A	63.03	63.03	

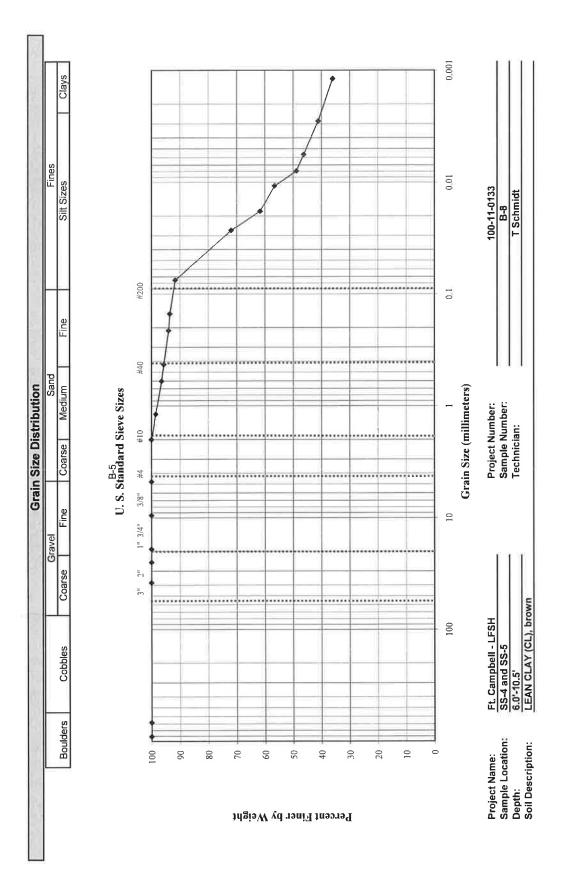
\*Percent Passing is adjusted for Hydroscopic Moisture

## Hydrometer Readings

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	к	D.mm
2	20.0	1.031	1.028	71.8515	71.8515	8.1	4.0500	0.01336	0.0269
5	20.0	1.027	1.024	61.5870	61.5870	9.2	1.8400	0.01336	0.0181
15	20.0	1.025	1.022	56.4548	56.4548	9.7	0.6467	0.01336	0.0107
30	20.1	1.022	1.019	48.7564	48.7564	10.5	0.3500	0.01334	0.0079
60	20.3	1.021	1.018	46.1903	46.1903	10.7	0.1783	0.01331	0.0056
250	20.6	1.019	1.016	41.0580	41.0580	11.3	0.0452	0.01326	0.0028
1440	21.6	1.017	1.014	35.9258	35.9258	11.8	0.0082	0.01310	0.0012

Sieve #	Diameter (mm)	Mass Retained (Grams)	Percent Passing (%	%)
16	1.18mm	0.97	98.43	
30	0.6mm	2.21	96.41	
40	0.425mm	2.71	95.60	
70	0.212mm	3.76	93.90	
100	0.150mm	4.01	93.49	
200	0.08mm	5.17	91.61	





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## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

Project Name:

Ft. Campbell - LFSH

Project Number:

100-11-0133

Sample Location:

SS-2 and SS-3

Sample Number:

B-9

Depth:

1.5'-5.5'

Date Received:

2/14/2012

**Soil Description:** 

LEAN CLAY (CL), dark brown

CONSTANTS:

151H

Dispersing Agent:

Sodium Hexa Meta Phosphate

Hydrometer Type: Zero Correction:

0.003

Specific Gravity Of Solids:

2.66 19.84

Meniscus:

0.003

Center or Gravity Constant (cm):

4 40/

Viscosity of Water @ 70°F

0.00001

Hygroscopic Moisture (%):

1.4%

## Sieve Analysis to #10:

Total Air Dry Sample (grams):

64.37

-!	y campic (	granio).	04101		
Ĭ	Sieve #	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)
ı		(mm)	(Grams)	Retained (Grams)	
j	1.5 in.	38.1 mm	0	0	100.0
Ì	1 in.	25 mm	0	0	100.0
j	3/4 in.	19.1mm	0	0	100.0
ı	3/8 in.	9.51mm	0	0	100.0
١	#4	4.75mm	0	0	100.0
ı	#10	2.0mm	0	0	100.0
Ì	Pan	N/A	64.37	64.37	

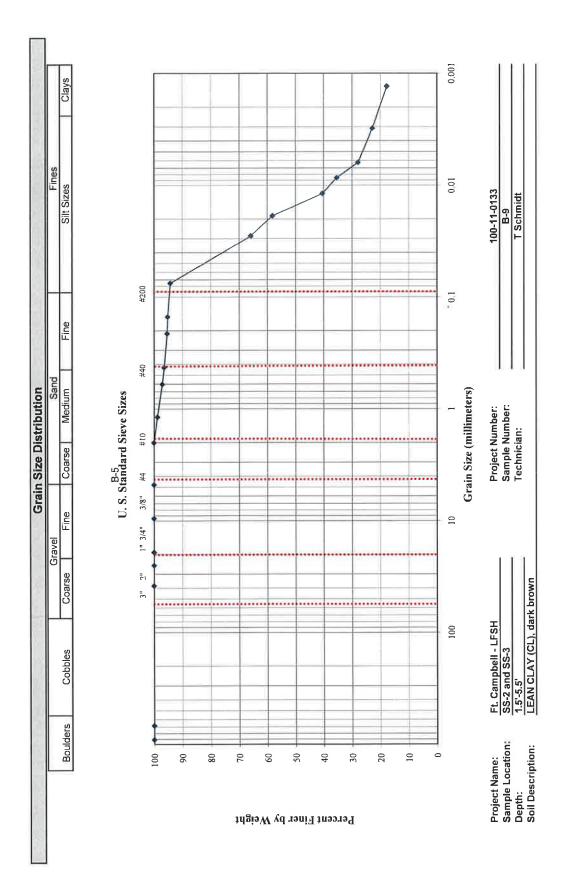
\*Percent Passing is adjusted for Hydroscopic Moisture

#### Hydrometer Readings

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	к	D.mm
2	20.0	1.029	1.026	65.6591	65.6591	8.6	4.3000	0.01361	0.0282
5	20.0	1.026	1.023	58.0830	58.0830	9.4	1.8800	0.01361	0.0187
15	20.0	1.019	1.016	40.4056	40.4056	11.3	0.7533	0.01361	0.0118
30	20.2	1.017	1.014	35.3549	35.3549	11.8	0.3933	0.01357	0.0085
60	20.3	1.014	1.011	27.7788	27.7788	12.6	0.2100	0.01356	0.0062
250	20.7	1.012	1.009	22.7281	22.7281	13.1	0.0524	0.01349	0.0031
1440	21.5	1.010	1.007	17.6774	17.6774	13.7	0.0095	0.01336	0.0013

Sieve #	Diameter (mm)	Mass Retained (Grams)	Percent Passing (%)
16	1.18mm	0.78	98.77
30	0.6mm	1.89	97.02
40	0.425mm	2.32	96.34
70	0.212mm	2.99	95.29
100	0.150mm	3.11	95.10
200	0.08mm	3.71	94.15





K. S. Ware and Associates, LLC 54 Lindsley Ave.. Nashville, TN 37210



## REPORT OF PARTICLE SIZE ANALYSIS OF SOILS, ASTM D422

**Project Name:** 

Ft. Campbell - LFSH

**Project Number:** 

100-11-0133

Sample Location:

SS-3 and SS-4

Sample Number:

B-11

Depth:

4.0'-8.0'

**Date Received:** 

2/14/2012

Soil Description:

LEAN CLAY (CL), brown

#### CONSTANTS:

Hydrometer Type:

151H

Dispersing Agent:

Sodium Hexa Meta Phosphate

Zero Correction:

0.003

Specific Gravity Of Solids:

2.83

Meniscus:

0.001

Center or Gravity Constant (cm):

19.84

Viscosity of Water @ 70°F:

0.00001

Hygroscopic Moisture (%):

2.2%

## Sieve Analysis to #10:

Total Air Dry Sample (grams):

60.60

-	y Campic (	granio,.			
ľ	Sieve #	Diameter	Mass Retained	Cumulative Mass	Percent Passing* (%)
١		(mm)	(Grams)	Retained (Grams)	
ı	1.5 in.	38.1 mm	0	0	100.0
ı	1 in.	25 mm	0	0	100.0
١	3/4 in.	19.1mm	0	0	100.0
١	3/8 in.	9.51mm	0	0	100.0
١	#4	4.75mm	0	0	100.0
Ĭ	#10	2.0mm	Ō	0	100.0
١	Pan	N/A	60.6	60.6	

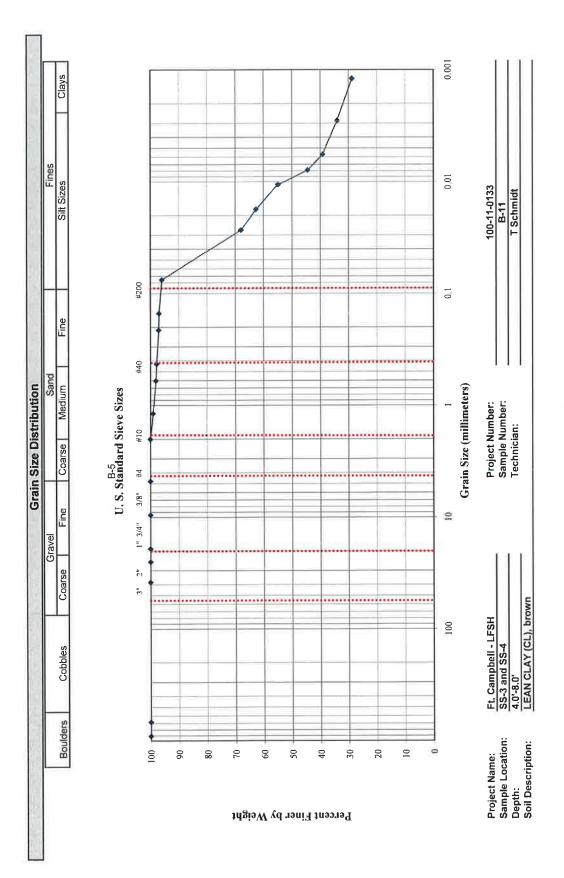
\*Percent Passing is adjusted for Hydroscopic Moisture

#### Hydrometer Readings

Elapsed Time (Min)	Temp (C)	Actual Hyd. Reading	Corr. Hyd. Reading	Act. % Finer	Adj. % Finer	L	L/t	К	D.mm
2	20.0	1.029	1.026	67.8349	67.8349	8.6	4.3000	0.01296	0.0269
5	20.0	1.027	1.024	62.6169	62.6169	9.2	1.8400	0.01296	0.0176
15	20.0	1.024	1.021	54.7898	54.7898	10	0.6667	0.01296	0.0106
30	20.2	1.020	1.017	44.3536	44.3536	11	0.3667	0.01293	0.0078
60	20.3	1.018	1.015	39.1355	39.1355	11.5	0.1917	0.01291	0.0057
250	20.7	1.016	1.013	33.9175	33.9175	12.1	0.0484	0.01285	0.0028
1440	21.5	1.014	1.011	28.6994	28.6994	12.6	0.0088	0.01273	0.0012

Sieve #	Diameter	Mass Retained	Percent Passing	(%)
	(mm)	(Grams)		
16	1.18mm	0.58	99.02	
30	0.6mm	1.18	98.01	
40	0.425mm	1.33	97.76	
70	0.212mm	1.77	97.01	
100	0.150mm	1.84	96.90	
200	0.08mm	2.45	95.87	





K. S. Ware and Associates, LLC 54 Lindsley Ave. Nashville, TN 37210



	Specific Gravity of Soils -	- AASHTO T100	
Project: Boring #: B-1 Visual Classification:	Ft. Campbell - LFSH Sample ID: SS-6 and SS- LEAN CLAY (CL), light brown,		100-11-0133 14.0'-20.0'
Mass of the Pycnometer F Test Temperature: Correction at 20 <sup>o</sup> C (Table	Filled with Water at Test Temperature: Filled with Water and Sample at the Test  1):  mple at the Test Temperature:	st Temperature:	27.65 g 661.33 g 679.11 g 24.6 °C 0.99898 2.803 2.800
Tested By	T Schmidt	Date2	2/22/2012
Reviewed By	Solley	Date	29/12



	Specific Gr	avity of Soils - A	ASHTO T100	
Project: Boring #: Visual Classification:	Ft. Camp Sample ID:	bell - LFSH SS-2 and SS-3 LEAN CLAY (CL), brow	Project No.: Depth:	100-11-0133 1.5'-5.5'
Pycnometer #: P-7 Mass of the Oven-Dry S Mass of the Pycnomete Mass of the Pycnomete Test Temperature: Correction at 20 <sup>0</sup> C (Tab Specific Gravity of the S	er Filled with Water a for Filled with Water a fole 1): Sample at the Test <sup>-</sup>	and Sample at the Test T	emperature:	27.68 g 664.98 g 682.53 g 24.5 °C 0.999
Tested By	T Schmidt		Date 2	2/22/2012

Reviewed By

Phone (615) 255-9702 Fax (615) 256-5873

Date \_\_\_\_\_2/29/12\_



Specific Gravity of Soils – AASHTO T100				
Project: Boring #: B-3 Visual Classification:	Ft. Campbell - LFSH Sample ID: SS-3 and LEAN CLAY (CL		100-11-0133 4.0'-7.5'	
Mass of the Pycnomet Test Temperature: Correction at 20 <sup>0</sup> C (Ta	Soil: er Filled with Water at Test Temperaturer Filled with Water and Sample at the ble 1): Sample at the Test Temperature:		38.96 g 668.14 g 693.40 g 24.7 °C 0.99896 2.845 2.842	
Tested By	T Schmidt	Date 2	2/22/2012	

Reviewed By

Phone (615) 255-9702 Fax (615) 256-5873

2/29/12

Date\_\_



Specific Gravity of Soils – AASHTO T100				
Project: Boring #: B-4 Visual Classification:	Ft. Campbell - LFSH  Sample ID: SS-3 and State   LEAN CLAY (CL),		100-11-0133 4.0'-7.5'	
Mass of the Pycnomete Test Temperature: Correction at 20 <sup>0</sup> C (Tal	er Filled with Water at Test Temperature er Filled with Water and Sample at the T ble 1): Sample at the Test Temperature:	: est Temperature: - -	32.02 g 662.87 g 683.31 g 24.8 °C 0.99894	
Specific Gravity of the	Sample at 20°C:		2./62	
Tested By	T Schmidt	Date2	2/22/2012	

K. S. Ware and Associates, L.L.C.54 Lindsley Ave.Nashville, Tennessee 37210

Reviewed By

Phone (615) 255-9702 Fax (615) 256-5873

Date 2/29/12



Specific Gravity of Soils – AASHTO T100				
Project: Boring #: B- Visual Classification:	Ft. Campbell - LFSH  Sample ID: SS-6 and LEAN CLAY (CL), br		100-11-0133 14.0'-20.0'	
Mass of the Pycnome Test Temperature: Correction at 20 <sup>0</sup> C (T	y Soil:  Ster Filled with Water at Test Temperate  Ster Filled with Water and Sample at the  Ster Filled with Water and Sample at the  Ster Filled with Water and Sample at the  Ster Filled with Water and Sample at the	ure: e Test Temperature:	33.19 g 661.90 g 683.54 g 24.3 °C 0.99904  2.875 2.872	
Tested By	T Schmidt	Date	2/22/2012	

K. S. Ware and Associates, L.L.C. 54 Lindsley Ave.

Reviewed By

Nashville, Tennessee 37210

Phone (615) 255-9702 Fax (615) 256-5873

2/29/12

Date \_\_\_\_\_



Specific Gravity of Soils – AASHTO T100				
Project: Boring #: B-7 Visual Classification:	Ft. Campbell - LFSH  Sample ID: SS-3 and S  LEAN CLAY (CL),		100-11-0133 4.0'-7.5'	
Mass of the Pycnomet Test Temperature: Correction at 20 <sup>0</sup> C (Ta	Soil: ter Filled with Water at Test Temperature ter Filled with Water and Sample at the Table 1): Sample at the Test Temperature:		26.74 g 660.04 g 677.29 g 24.7 °C 0.99896 2.817 2.814	
Tested By	T Schmidt	Date2	2/22/2012	
Poviowod By	and an	Date 2	129/12	



Specific Gravity of Soils – AASHTO T100				
Project: Boring #: B-8 Visual Classification:	Ft. Campbe Sample ID:	I - LFSH SS-4 and SS-5 EAN CLAY (CL), brown	Project No.: _ Depth:	100-11-0133 6.0'-10.5'
Pycnometer #: P-1 Mass of the Oven-Dry S Mass of the Pycnomete Mass of the Pycnomete Test Temperature: Correction at 20°C (Tal Specific Gravity of the S Specific Gravity of the S	er Filled with Water at T er Filled with Water and ole 1): Sample at the Test Ten	Sample at the Test Ten	nperature:	26.77 g 662.86 g 679.79 g 24.9 °C 0.99892 2.721 2.718
Tested By  Reviewed By	T Schmidt			/23/2012 /29/12

Reviewed By



	Specific Gravity of Soils	- AASHTO T100	
Project: Boring #: B-9 Visual Classification:	Ft. Campbell - LFSH Sample ID: SS-2 and S LEAN CLAY (CL), da		100-11-0133 1.5'-5.5'
Mass of the Pycnomet Test Temperature: Correction at 20 <sup>0</sup> C (Ta	Soil: er Filled with Water at Test Temperatur er Filled with Water and Sample at the ble 1): Sample at the Test Temperature:		33.52 g 660.02 g 680.96 g 24.9 °C 0.99892 2.665 2.662
Tested By	T Schmidt	Date	2/23/2012

T Schmidt

Tested By

Reviewed By

Phone (615) 255-9702 Fax (615) 256-5873

Date\_\_\_\_



Specific Gravity of Soils – AASHTO T100				
Project: Boring #: B-11 Visual Classification:	Ft. Campbell - LFSH  Sample ID: SS-3 and S  LEAN CLAY (CL),		100-11-0133 4.0'-8.0'	
Mass of the Pycnomete Test Temperature: Correction at 20 <sup>0</sup> C (Tab	r Filled with Water at Test Temperature r Filled with Water and Sample at the T ele 1): Sample at the Test Temperature:		34.76 g 662.18 g 684.68 g 24.6 °C 0.99898 2.836 2.833	
Tested By	T Schmidt	Date 2	2/22/2012	

Reviewed By

Phone (615) 255-9702 Fax (615) 256-5873

Date \_\_\_\_

## **Appendix E – Geophysical Report**

**Time Domain Electromagnetic (TDEM) Testing** 

# Geophysical Report Live Fire Exercise Shoothouse Facility Fort Campbell, Kentucky

Section: APPENDIX A

#### Submitted To:

K.S. Ware and Associates, LLC 54 Lindsley Avenue Nashville, Tennessee 37210

Submitted By:

AMEC Environment & Infrastructure, Inc. 800 Marquette Avenue, Suite 1200 Minneapolis, Minnesota 55402

March 2012

Contract: W912QR-10-D-0001 Delivery Order No. 0008

Section: APPENDIX A

March 19, 2012

Ms. Heidi Wilbarger Project Manager K.S. Ware and Associates, LLC 54 Lindsley Avenue Nashville, TN 37210

Re: Geophysical Investigation Report
Live Fire Exercise Shoothouse Facility
Fort Campbell, Kentucky
AMEC Project No. 731100080

Dear Ms. Wilbarger;

AMEC Environment & Infrastructure, Inc. is pleased to present this Geophysical Investigation report for the proposed Live Fire Exercise Shoothouse Facility (LFSH) at Fort Campbell, Kentucky. We appreciate the opportunity to assist you on this project.

If you have any questions or desire further information, please feel free to contact myself or Raye Lahti as identified below.

Sincerely,

Christopher Buckman, P.G.

Chur AS 2

Project Manager/Geophysicist

Tel: (630) 724-8527

Raye Lahti, P.G.

Associate - Senior Geophysicist

Tel: (970) 569-3361

Lay & Lalt

Geophysical Report Proposed LFSH Facility Fort Campbell, Kentucky March 2012

Section: APPENDIX A

#### **TABLE OF CONTENTS**

<u>ACR</u>	ONYMS	AND ABBREVIATIONS	II
1.0		UCTION TE BACKGROUND	
2.0	2.1 EM 2.1	OF WORK	2 2
3.0	RESULT	<sup>-</sup> S	4
4.0	CONCLU	JSIONS	4
5.0	RECOM	MENDATIONS	5
6.0	REFERE	ENCES	6
		<u>LIST OF FIGURES</u>	
FIGU FIGU	JRE 1 JRE 2 JRE 3 JRE 4	Site Location Map EM61 Channel 3 Response Contour Map Interpreted EM61 Channel 3 Response Contour Map Existing Site Utility Map	
		LIST OF APPENDICES	
APPENDIX A APPENDIX B APPENDIX C APPENDIX D APPENDIX E		Site Daily Reports Daily Photo Logs	

Geophysical Report Proposed LFSH Facility Fort Campbell, Kentucky March 2012

Section: APPENDIX A

#### **ACRONYMS AND ABBREVIATIONS**

AHA Activity Hazard Analysis

AMEC Environment & Infrastructure

DGPS Differential global positioning system

EM electromagnetic

EM61 Geonics® EM61 MK2A Time Domain Metal Detector

Ft feet/foot

ft-bgs feet below ground surface

Geonics Geonics, Ltd

GeoSoft Geosoft Oasis Montaj

GIS Geographical Information System

GPR Ground-Penetrating Radar

HSP Health and Safety Plan

In inch/inches

KSWA K. S. Ware and Associates, LLC

LFSH Live Fire Shoothouse Facility

mV millivolt

PQCP Project Quality Control Plan

QC Quality Control

TDEM Time Domain Electromagnetic

USACE United States Army Corps of Engineers

UST Underground Storage Tank

WAAS Wide Area Augmentation System

Geophysical Report Proposed LFSH Facility Fort Campbell, Kentucky

Section: APPENDIX A

March 2012

#### 1.0 INTRODUCTION

This Geophysical Investigation summary report has been prepared to document K.S. Ware and Associates, LLC's (KSWA) geophysical investigation activities at the Live Fire Exercise Shoothouse Facility (LFSH) at Fort Campbell, Kentucky (Site). KSWA along with teaming partner, AMEC Environment & Infrastructure, Inc. (AMEC) was contracted to perform the geophysical investigation by the United States Army Corps of Engineers (USACE), Louisville District under Contract Number W912QR-10-D-0001 Delivery Order 0008.

The geophysical investigation was conducted using a time domain electromagnetic (TDEM) metal detection survey to identify and delineate any areas containing subsurface debris, uncontrolled fill material, or other subsurface anomalies that may require additional investigation prior to the onset of planned construction activities at the Site. The TDEM method specifically identifies subsurface metal associated with debris, fill and other subsurface anomalies. All work completed as part of this investigation was conducted in accordance with the work plan as outlined in the "Project Quality Control Plan" (KSWA, December 2011).

The report outlines the site background, KSWA's scope of work, geophysical survey system and data collection methods, survey results and provides conclusions and recommendations based upon findings at the Site.

#### 1.1 SITE BACKGROUND

Fort Campbell is located between the cities of Clarksville, Tennessee and Hopkinsville, Kentucky, approximately 55-miles north of Nashville, Tennessee. The project site is located within Range 44 and is situated entirely within the Tennessee portion of the Installation. The approximate 10-acre parcel is currently an 8-acre open space grassed area and 2-acre wooded section. Existing site structures include the current shoothouse facility, observation bleachers, and pavilion structure. This area is positioned between, though not bound by, Angels Road and Jordan Springs Road to the north and south respectively. The Site is primarily grassed covered with some areas of gravel and asphalt paving. Trees are located throughout the survey area and are identified by gray-filled polygons on Figures 2 and 3.

Geophysical Report Proposed LFSH Facility Fort Campbell, Kentucky

Section: APPENDIX A

March 2012

#### 2.0 **SCOPE OF WORK**

This section describes the field activities conducted at the Site. The work scope required a geophysical survey utilizing the TDEM survey method. The TDEM survey was conducted using the Geonics Limited EM61 MK2A® high resolution metal detection system (EM61) to identify and delineate any areas containing subsurface debris, uncontrolled fill material, or other subsurface anomalies that would require additional investigation. The system is specifically designed for metal detection and senses subsurface debris, uncontrolled fill and subsurface anomalies that contain metal.

Prior to performing the field activities KSWA completed a Project Quality Control Plan (PQCP) that documented the work scope, work plan, review process and quality indicators. An Activity Hazard Analysis (AHA) and Site Specific Health and Safety Plan (HSP) were also completed. All work conducted on Site was in accordance with the HSP and the PQCP. EM61 survey activities were conducted in accordance with ASTM D6820 and the field work was also performed under the direction of a licensed professional geologist with a minimum of 10 years experience working in the field of Geophysics.

#### 2.1 **EM61 SYSTEM AND DATA COLLECTION METHODS**

The geophysical investigation was conducted from February 20-24, 2012 within the approximately 10.6-acre survey area. EM61 data collection was completed over an approximate 8.1-acre area of investigation with remaining areas inaccessible due to terrain, dense vegetation, or standing water. The EM61 survey area is presented on Figure 1.

Site field forms, daily reports, and photograph logs are presented in Appendix A, B and C respectively.

#### Geonics EM61 MK2A 2.1.1

The EM61 is a high resolution geophysical system designed for the detection of both ferrous and nonferrous metal targets. The system consists of two (1-m x 0.5-m) rectangular coils separated vertically by 0.3 m. A transmitter/receiver coil is located on the bottom (0.42 m above the ground) with a differential coil located 0.42 m above the bottom coil. The system generates a pulsed electromagnetic (EM) field that is rapidly turned off. Between pulses, a secondary field is created that induces eddy currents in the ground and in nearby metallic objects. During this time, the secondary magnetic field is measured (in millivolts) by the receiver coil at three separate time gates, or channels, and by the differential coil. Low measured relative responses (background values) are indicative of little or no metal present while higher responses indicate the presence of metallic objects within the detection depth of the instrument. The depth of detection is dependent on the size and orientation of the metallic object. Using the EM61, it is expected that a standard 55 gallon drum can be detected to approximately ten feet below ground surface under ideal conditions. Although the EM61 can be operated near sources of Geophysical Report Proposed LFSH Facility Fort Campbell, Kentucky

Section: APPENDIX A

cultural interference (i.e. fences, buildings, and power lines) these features, if present, are noted by the field team to differentiate from the detection of subsurface features of interest. An

increased response is expected as the EM61 approaches surface metallic features.

A Hemisphere XF 101® differential global positioning system (DGPS) with StarFire® DGPS correction was used to provide sub meter accuracy for data collection. The GPS was connected to the Juniper Systems Archer® data logger, providing simultaneous geospatial location with the measured EM61 data.

Quality control (QC) tests conducted in the field included a 6-Line test, Static test and Standard test. A latency value of 0.36 seconds was determined based on data from the 6-Line test (Appendix D). The latency value was applied to the survey data collected at the Site. The Static and Standard tests were conducted daily prior and subsequent to data collection. Though the data was monitored real-time to confirm that the EM61 system was working properly, QC figures were produced following survey data collection and are presented in Appendix D.

The EM61 was assembled and calibrated according to manufacturer specifications. Calibration included selection of an optimum location at the Site with minimal observed interference and estimated background soil conditions. Data were collected along lines at 0.5 foot intervals with an average line spacing of 5 feet. EM61 data are provided in GIS format in Appendix E.

#### 2.2 EM61 DATA PROCESSING

Following daily completion of data collection using the EM61, the data were transferred from the Archer data logger to a field computer for on-site review. AMEC geophysicists reviewed the data daily and prepared field maps using Geosoft Oasis montaj (Geosoft), an advanced geophysical data processing and mapping program. The EM61 millivolt response for time gate 3 was utilized for the survey to provide the best data set with optimum depth of investigation.

Data processing with Geosoft included evaluation of the QC processes (Static and Standard test and 6-Line test), grid data processing to remove data spikes, instrument drift (leveling), and perform latency corrections. Preliminary gridded color contour maps were prepared and reviewed in the field. AMEC recorded locations of above ground sources of metallic interference while in the field. Final color contour maps were prepared in the office to include in the report with mapped surface features labeled on the channel 3 response contour maps that are presented in Figure 3.

Geophysical Report

Section: APPENDIX A

Proposed LFSH Facility Fort Campbell, Kentucky March 2012

#### 3.0 RESULTS

The following results are based upon geophysical data processing, interpretation and maps of existing subsurface features such as utilities that were made available by the Ft. Campbell Dept. of Public Works GIS department. These maps were supplied in digital format.

The EM61 survey results are presented in Figure 2. Annotations from field observations, existing surface and subsurface features from GIS and interpretations provided in Figure 3. Elevated instrument response resulting from the presence of subsurface metallic items is indicated by yellow to pink shading. Areas of interpreted background or undisturbed areas are indicated by light blue to dark blue shading. All EM61 data are archived in GIS format and are provided in Appendix E.

Interpreted anomalies are categorized into either linear, point source or spatial features. Interpreted linear anomalies from the collected data exhibited a lower relative instrument response versus background and are associated with the north-south roadway located within the central portion of the survey area (Figures 2 and 3). Remaining anomalies are classified as point source or spatial targets and are generally less than 2 meters in diameter and greater than 40 mV in response. These features show limited patterns in distribution. Several anomalies exhibit similarities in instrument response, size, and shape and are located in the northern half of the site. An area containing a high density of anomalies is highlighted by a yellow and blackdashed line and located in the north central portion of the site, northeast of an existing Site structure. Remaining anomalies are located throughout the survey area and likely result from utilities, metallic debris, or uncontrolled fill material associated with construction or historic site use. The coordinates for point source anomalies have been provided electronically in Excel format and anomalies greater than 2 meters in size are identified by black "+'s". The locations of mapped base utilities, as provided by the Fort Campbell Public Works GIS Department, are illustrated in Figure 4. Above ground sources of metallic interference in the areas surveyed were visible during data collection and are labeled accordingly in Figure 3. These above ground sources include metal posts, utility access covers, metallic debris, and buildings.

#### 4.0 **CONCLUSIONS**

Findings regarding subsurface conditions at the Site are based on the results of this investigation and are as follows:

Numerous isolated point source/spatial anomalies (black "+'s" on Figure 3) were detected throughout the Site and may be the result of military activities during changes in site use during its history and include changes in site usage, construction, and may be caused by metallic materials left in place or discarded. The coordinates for these point source targets have been supplied electronically in Excel format.

Geophysical Report

Section: APPENDIX A

Proposed LFSH Facility Fort Campbell, Kentucky March 2012

- Interpreted anomalies that are based upon shape, orientation, and level of • instrument response, may be the result of subsurface fill material, buried utilities, reinforced concrete foundations, or scattered metallic debris.
- Several sources of above ground metallic interference were identified and include metal posts, utility access covers, metallic debris, and buildings. These interferences are identified by white squares or red to pink color shading immediately adjacent to building outlines.
- The correlation of geophysical responses with probable subsurface features is based upon the experience gained through past results of similar surveys, existing site history, and known subsurface information. It is possible that some variation from these interpretations may exist at this Site.

#### 5.0 RECOMMENDATIONS

The following recommendations are based on the findings and conclusions discussed in this report:

- It is recommended that identified areas that contain a high density of metallic anomalies (north-central portion of site; yellow-black dashed outline) be further investigated through shallow excavations in an effort to determine their source. This recommendation is specific to those anomalous areas that have been identified above (Figure 3). Further investigation of point source/spatial targets greater than 2 meters in diameter should also be included. These are identified by black "+'s" in Figure 3.
- If it is determined by Fort Campbell and USACE personnel that proposed site redevelopment may be impacted by interpreted subsurface point source metallic anomalies, further investigation is warranted.

Section: APPENDIX A Geophysical Report Proposed LFSH Facility

Fort Campbell, Kentucky March 2012

#### 6.0 REFERENCES

K.S. Ware and Associates, LLC., 2011 Activity Hazard Analysis, Nashville, Tennessee

K.S. Ware and Associates, LLC., 2011 Project Quality Control Plan, Nashville, Tennessee

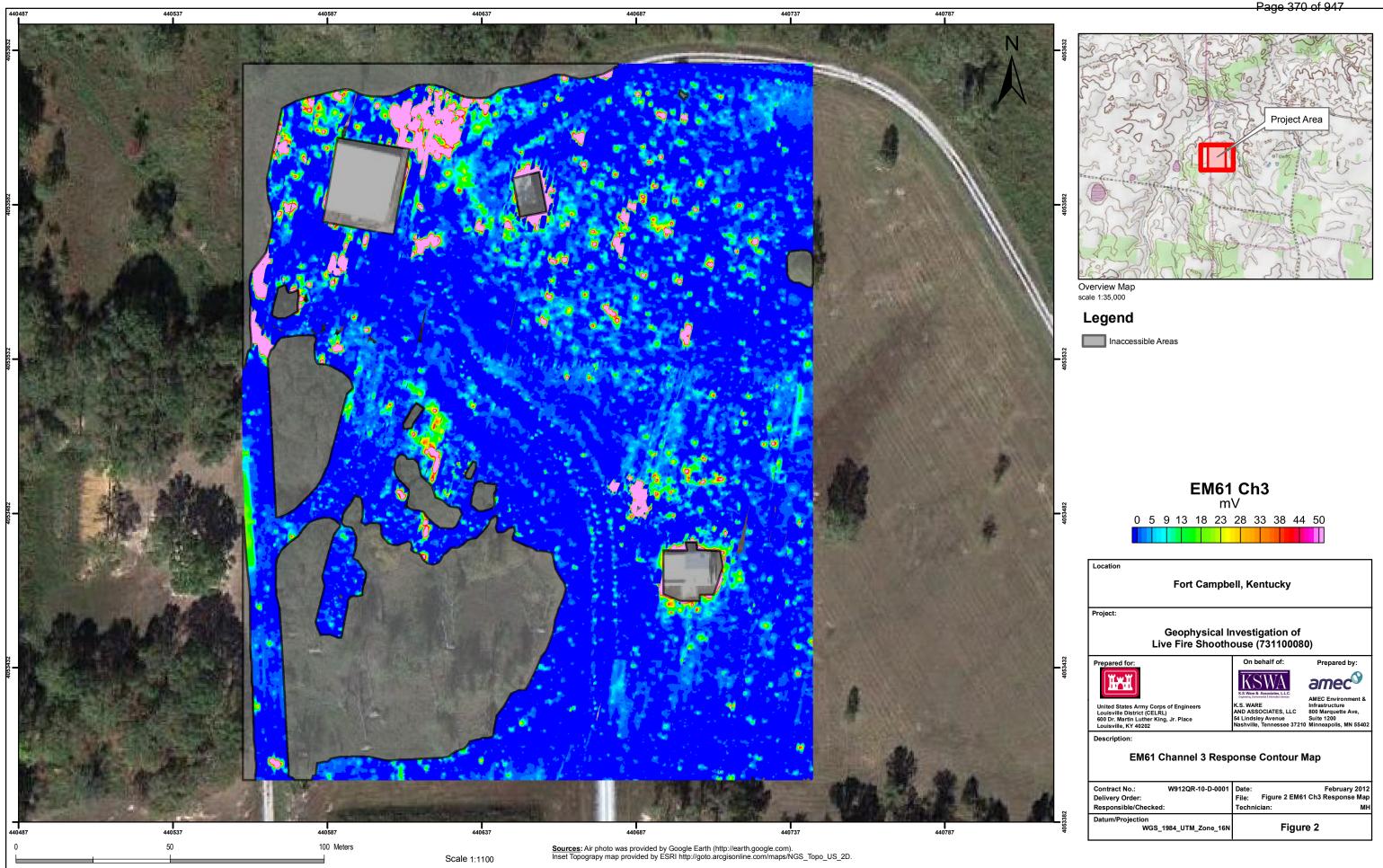
W912QR-23413770 CERTIFIED FINAL-003 Page 368 of 947

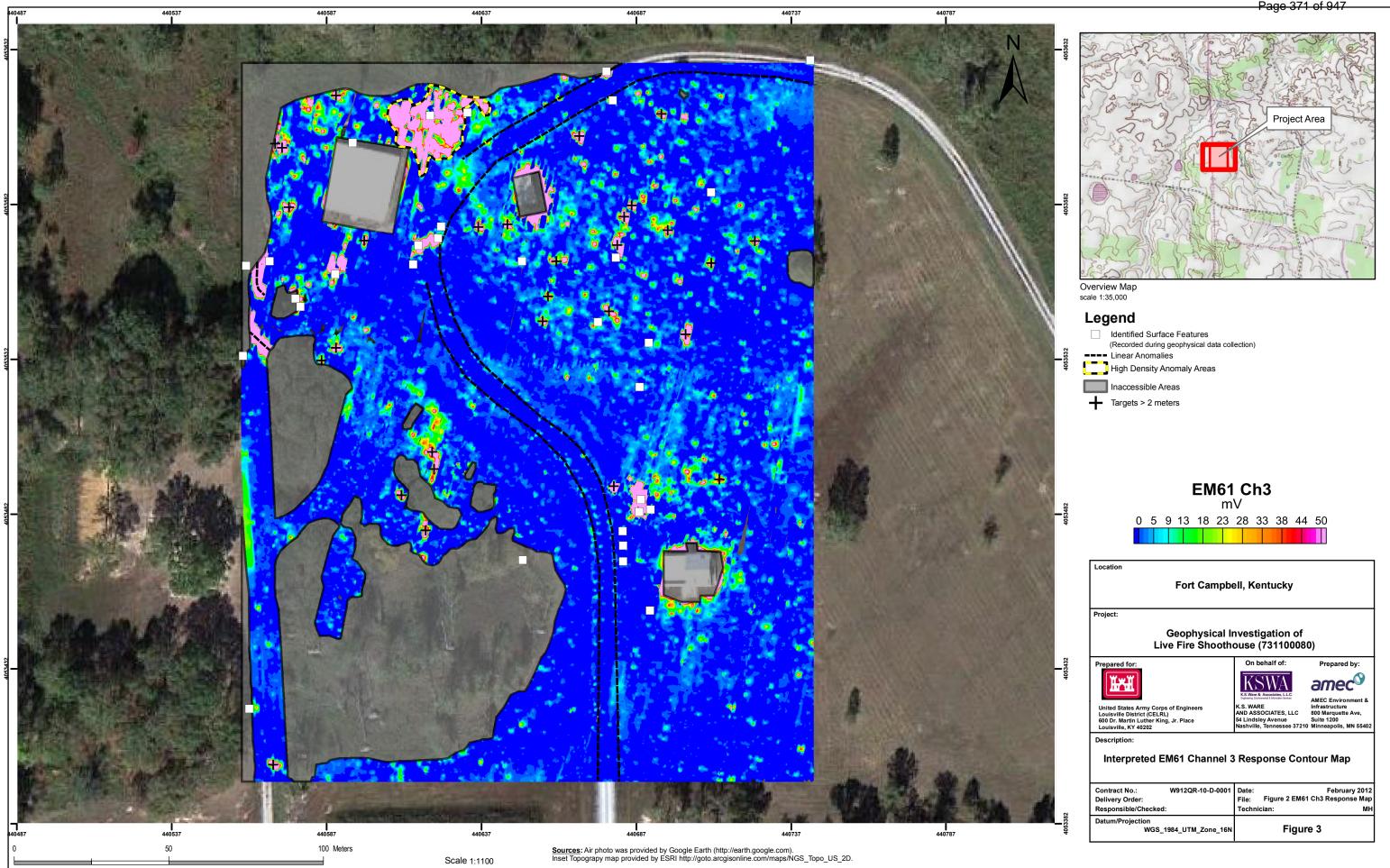
Geophysical Report Proposed LFSH Facility Fort Campbell, Kentucky March 2012

Section: APPENDIX A

#### **FIGURES**









W912QR-23413770 CERTIFIED FINAL-003 Page 373 of 947

Geophysical Report Live Fire Shoot House Fort Campbell, Kentucky

Section: APPENDIX A

March 2012

## **APPENDIX A**Site Field Forms

### DELIVERABLE REVIEW AND APPROVAL

	1		2
PAGE	- [	of	

GEO- DELIVERABLE QC FORMS

		Do	GM INI	TIAL/FOLLOW-ON PHASE CHECKLIST			
Field	Staff On-	-site:	t. HAN	SON, M. HOLZBALLER			
Date: 21 FCB12 Project Number: 731100080							
Yes No Initial Question							
1.	X			Has the Tx/Rx and electronics array according been assembled according to the operating man			
2.	X			Has the TDEM system been interfaced with the GPS system at 1 Hz (GGA string).			
3.	Ø			Has the transmitter warmed up the system's electronics (~ 10 to 15 minutes).			
4.	ΣĮ.			Has the sampling interval been set to 10 Hz.			
5.	Ø			Has the acquisition parameters gate times been set at 216, 366, 660 and 1266 milliseconds).			
3.	Ø			Has a unique data file been created.			
7.	X			Has a nulling been performed.			
3.	(X)			Has the Personnel Test been completed.			
}.	( <u>†</u>			Has the Cable Shake Test been completed.			
0.	Ď			Has the initial Instrument Standardization Test been completed.			
1.	Ø			Has the initial Time Calibration Test been completed.			
2.	#			Has the Point Position Test been completed.			
3.	X			Has each transect collected been incremented (e.g. Transect 1 = Line 1 Transect 2 = Line 2).			
4.		ľΧ		Has the closing Time Calibration Test been completed.			
5.	$\boxtimes$			Has the closing Instrument Standardization Test been completed.			
6.	図			Has a detailed geophysical log book been completed.			
7.	Ø			Has data been preliminary checked for GPS data gaps/dropouts.			
8.		A		Has geophysical log book been signed.			
9.	X		, 🗆	Has all data been transferred over to Site Geophysicists.			

Signature (Site Geophysicist)

	QC checked by Date:	Field Data Sheet	QA checked by Date:
	Project Name: LFSH  Geophysical Contractor: KSWAPE AMEC  Project Geophysicist: C BUCKMAN  Survey Area ID: LFSH Date: Feb '21  Survey Type: SGrid Meandering Path Transect  Coordinate System: SUTM State Plane NAD  Sketch of Survey Area: Approx. Ser	Other	FAT CAMPBELL, KY :: AHANSON, M. HOLZBAUER
BEGAN DOTA COLVECTI IN ACLE THEE CL AVER	TREE COVER Swamp) } road	houses, ity box	Terrain:    Level  Moderate Slope   Steep   Rolling  Ruts   Gullics     Rocky   Swampy   Dangerous    Tree Cover: Tree Height:     None   Light   Medium   Thick     Brush:
NW	Grid Corner Coordinates:  UTM/State Plane  Local  SW 44074, 4053345  W 440744, 4053628  SE 440744, 4053345  Raw Data File Name:  Geophysical Instrumentation: EMW Mk 2A  Base Station:  Navigation Method: DOPS, NAVW SOPTW  Additional Comments:  20120221-12T AM  20120221-10L  20120721-A	Static Response Val	rift:  me:  Serial Number:  Serial Number:

20120221 -B

<b>DELIVERABLE</b>	<b>REVIEW</b>	AND	<b>APPROV</b>	AL

	l	2
PAGE	l of	£,

GEO- DELIVERABLE QC FORMS

	***	D	GM IN	ITIAL/FOLLOW-ON PHASE CHECKLIST			
Field	Staff On	-site:	4. HA	NSON, M. HOLZBAUER			
Date: 22 FEB12 Project Number: 731100080							
	Yes	No	Initial	Question			
1.	內			Has the Tx/Rx and electronics array according been assembled according to the operating manual			
2.	図			Has the TDEM system been interfaced with the GPS system at 1 Hz (GGA string).			
3.	$\square$			Has the transmitter warmed up the system's electronics (~ 10 to 15 minutes).			
4.	[3]			Has the sampling interval been set to 10 Hz.			
5.	N			Has the acquisition parameters gate times been set at 216, 366, 660 and 1266 milliseconds).			
6.				Has a unique data file been created.			
7.	×			Has a nulling been performed.			
8.	Ĭ			Has the Personnel Test been completed.			
9.	囟			Has the Cable Shake Test been completed.			
10.	$\square$			Has the initial Instrument Standardization Test been completed.			
11.	囟			Has the initial Time Calibration Test been completed.			
12.	$\boxtimes$			Has the Point Position Test been completed.			
13.	$\boxtimes$			Has each transect collected been incremented (e.g. Transect 1 = Line 1 Transect 2 = Line 2).			
14.		X		Has the closing Time Calibration Test been completed.			
15.	K			Has the closing Instrument Standardization Test been completed.			
16.	ΣĮ			Has a detailed geophysical log book been completed.			
17.	Ø			Has data been preliminary checked for GPS data gaps/dropouts.			
18.		$\boxtimes$		Has geophysical log book been signed.			
19.	(X)		, 🗆	Has all data been transferred over to Site Geophysicists.			
			ŧ	Signature (Site Geophysicist)			

QC checke	ed by	Field Data Sheet		QA checked by Date:
Project Nar Geophysica Project Geo Survey Are	me: LESH  Il Contractor: KSWAPC  ophysicist: C. BUCK  ia ID: LESH Dat  oe: AGrid Meandering P	MN 10: 22 FEB12	Design Center POC: Site Geophysicist: A. Field Team:	THANSON, M. HOLZBARIER
Coordinate		ane NAD 🗆 Local		Unit of Measure: ☑ meters☐ feet Arrow:
	POPTION OF SIT	road Had	houses ry bix	Terrain:  Level Moderate Slope Steep Rolling Ruts Gullics Rocky Swampy Dangerous  Tree Cover: Tree Height: None Light Medium Thick  Brush: None Light Medium Thick  Weather: Sunny Cloudy Drizzle Rain Thunderstorms Hail
SW 4405 NW 4407 SE 44070 Raw Data Fi Geophysical Base Station Navigation N	Grid Corner Coord  I'M/State Plane  176, 4053945  174, 4053628  44, 4053345  Ile Name:  Instrumentation: EMU  Comments:  Icthod: DGPS, NA	I.ocal  TIKZA  / SOFTWANZE	Static Response Value: Instrument Clock Drif Repeat Data File Name	t:
201	20222-1PT-M 20222-C 20222-D 20222-E	201202	22-F 22-6 22-IRT-PM	

DELIVERABLE	REVIEW.	AND APPR	OVAL

	1		7
<b>PAGE</b>	_/	of	

GEO- DELIVERABLE QC FORMS

DGM INITIAL/FOLLOW-ON PHASE CHECKLIST							
Field Staff On-site: A. HANSON, M. HOLZBAUER							
Date:	Date: 23 FB312 Project Number: 731100080						
	Yes	No	Initial	Question			
1.	$\boxtimes$			Has the Tx/Rx and electronics array according been assembled according to the operating manual			
2.				Has the TDEM system been interfaced with the GPS system at 1 Hz (GGA string).			
3.	[3]			Has the transmitter warmed up the system's electronics (~ 10 to 15 minutes).			
4.	[2]			Has the sampling interval been set to 10 Hz.			
5.	X			Has the acquisition parameters gate times been set at 216, 366, 660 and 1266 milliseconds).			
6.	团			Has a unique data file been created.			
7.				Has a nulling been performed.			
8.				Has the Personnel Test been completed.			
9.	囚			Has the Cable Shake Test been completed.			
10.	凶			Has the initial Instrument Standardization Test been completed.			
11.	凶			Has the initial Time Calibration Test been completed.			
12.	凶			Has the Point Position Test been completed.			
13.	$\boxtimes$			Has each transect collected been incremented (e.g. Transect 1 = Line 1 Transect 2 = Line 2).			
14.		N N		Has the closing Time Calibration Test been completed.			
15.	$\square$			Has the closing Instrument Standardization Test been completed.			
16.	囟			Has a detailed geophysical log book been completed.			
17.	囟			Has data been preliminary checked for GPS data gaps/dropouts.			
18.		7		Has geophysical log book been signed.			
19.	$\boxtimes$		, 🔲	Has all data been transferred over to Site Geophysicists.			
			,	Signature (Site Geophysicist)			

QC checked by Date:	Field D	ata Sheet	QA checked by Date:	
Project Name: LESH  Geophysical Contractor: KSWA  Project Geophysicist: C. BUC  Survey Area ID: LESH  Survey Type: Agrid Meanderin  Coordinate System: UTM Stat  Sketch of Survey Area:		Design Center POC: Site Geophysicist: f Field Team:  Other	OPT CAMPBELL, KY  1. HANGON, M. HOLZBAUER  Unit of Measure: (S) meters feet	
NORTHERN POPTION				
HAA HAA TOO TOO THE TO	high readily obv	ngs, no lans carre	Terrain:  Level Moderate Slope Steep Rolling Ruts Gullics Rocky Swampy Dangerous  Tree Cover: Tree Height: None Light Medium Thick  Brush: None Light Medium Thick  Weather: Sunny Cloudy Drizzle Rain Thunderstorms Hail	
Grid Corner Co UTM/State Plane SW 440976, 4053395 NW 440576, 4053628 NE 440744, 4053628	ordinates:	Battery Voltage: Static Background Va Static Response Value		
SE 440744, 4053315  Raw Data File Name:  Geophysical Instrumentation: EM  Base Station:		Instrument Clock Dri Repeat Data File Nam	e: Serial Number;	
Navigation Method: D6PS, N/Additional Comments:	TV SOFTWAPE		Serial Number:	
20120223-1PT-AM 20120223-H 20120223-1 20120223-J	20120223-K 20120223-L 20120223-M 20120223-N	2012022	13-1PT-PM	

W912QR-23413770 CERTIFIED FINAL-003 Page 380 of 947

Geophysical Report Live Fire Shoot House Fort Campbell, Kentucky

March 2012

Section: APPENDIX A

APPENDIX B
Daily Reports

Hanson, Andri

From: Hanson, Andri

Section: APPENDIX A

Sent: Tuesday, February 21, 2012 10:25 PM

To: 'Heidi Wilbarger'
Cc: Buckman, Christopher
Subject: LFSH Daily update

Attachments: DRAFT\_Map-20120221.pdf

#### Hi Heidi,

We arrived on site this morning and met with Tim Wanke for the UXO briefing. He helped us get everything taken care of as far as obtaining additional passes, radios and showed us to the site. We checked out the area, and it looks like we should be able to collect a fair amount of data within the wooded area at the southwestern corner of the site. We started data collection in that area today, as you can see in the attached DRAFT map (you'll see there are a few gaps where tree cover/shrubs were too thick). We also moved the western edge a little further west past the road as requested. I can send you coordinates showing how far west we extended if desired.

We will continue data collection in the southwestern portion and should finish what we are able to collect in the wooded area. I'll send a map of data collection tomorrow, so you will be able to see the total area we were able to collect within/around the trees. We are projecting to finish data collection on Thursday, weather permitting.

Please let me know if you have any questions or concerns.

#### Thanks!

#### Andri Hanson

#### Geophysicist

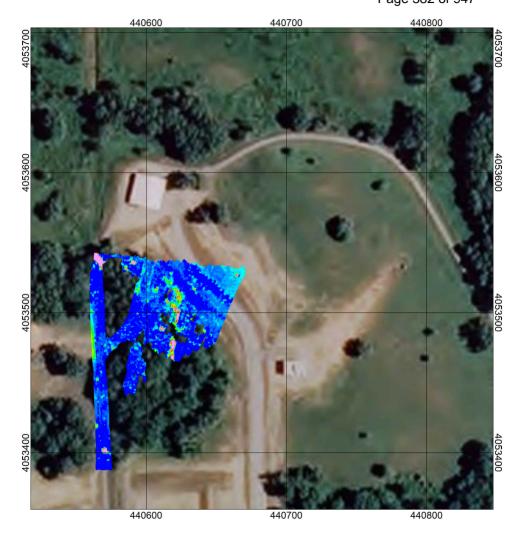
AMEC Environment & Infrastructure

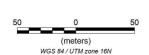
800 Marquette Ave, Suite 1200, Minneapolis, MN 55402-2876 USA

Fax: 612-332-2423 Tel: 612-332-8326 Direct: 612-252-3677 andri.hanson@amec.com

amec.com

#### Section: APPENDIX A W912QR-23413770 CERTIFIED FINAL-003 Page 382 of 947





**AMEC DRAFT Map - EM61 Data** Live Fire Shoot House 20120221 Thursday, February 07, 2013



Hanson, Andri

From: Hanson, Andri

Section: APPENDIX A

Sent: Thursday, February 23, 2012 6:31 AM

To: 'Heidi Wilbarger'
Cc: Buckman, Christopher
Attachments: DRAFT\_Map-20120222.jpg

Hi Heidi – We continued EM61 data collection in the southwestern portion of the site. Please see attached DRAFT map for data coverage – it shows what we were able to cover in the treed area. There is quite a bit of brush along the northern  $\sim$  15 feet of the site, making some data collection difficult – we will collect as much as possible.

We will continue data collection today, and may need to finish tomorrow. The field computer was acting up on us and we will need to recollect a small portion of the data today. It looks like the weather should hold out until this evening. Let me know if you have any questions.

#### Thanks!

#### Andri Hanson Geophysicist

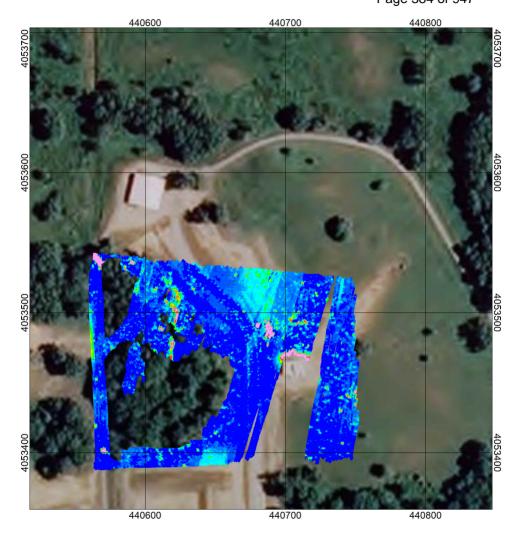
AMEC Environment & Infrastructure

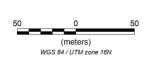
800 Marquette Ave, Suite 1200, Minneapolis, MN 55402-2876 USA

Fax: 612-332-2423 Tel: 612-332-8326 Direct: 612-252-3677 andri.hanson@amec.com

amec.com

#### Section: APPENDIX A W912QR-23413770 CERTIFIED FINAL-003 Page 384 of 947





**AMEC DRAFT Map - EM61 Data** Live Fire Shoot House 20120222 Thursday, February 07, 2013



#### Section: APPENDIX A

#### Hanson, Andri

From: Hanson, Andri

Sent: Thursday, February 23, 2012 8:14 PM

To: 'Heidi Wilbarger'
Cc: Buckman, Christopher

Subject: Daily report

Attachments: DRAFT\_Map-20120223.pdf

Hi Heidi – data collection was completed today at the LFSH. I've attached a draft map so you can see the areas covered. We will plan to get you a report and figures sometime next week. We will be demobilizing tomorrow afternoon. Please let me know if you have any questions.

Thanks!

#### Andri Hanson Geophysicist

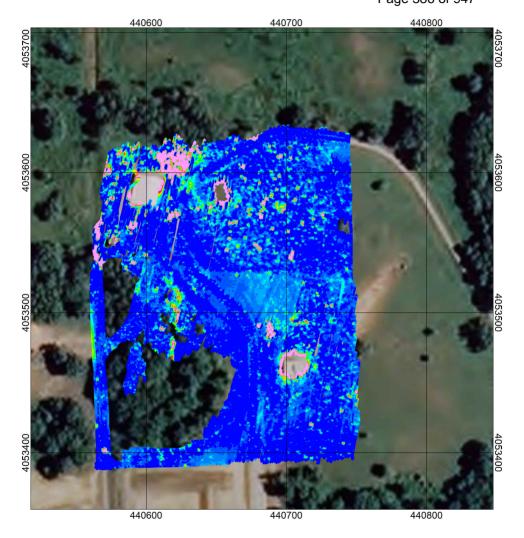
AMEC Environment & Infrastructure

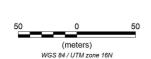
800 Marquette Ave, Suite 1200, Minneapolis, MN 55402-2876 USA

Fax: 612-332-2423 Tel: 612-332-8326 Direct: 612-252-3677 andri.hanson@amec.com

amec.com

#### Section: APPENDIX A W912QR-23413770 CERTIFIED FINAL-003 Page 386 of 947





**AMEC DRAFT Map - EM61 Data** Live Fire Shoot House 20120223 Thursday, February 07, 2013



W912QR-23413770 CERTIFIED FINAL-003 Page 387 of 947

Geophysical Report Live Fire Shoot House Fort Campbell, Kentucky March 2012

Section: APPENDIX A

**APPENDIX C**Photograph Log



Photo 1
EM61 Data collection
within the wooded (SW)
portion of the site.
21 FEB 12
Direction: SSW



Photo 2
EM61 Data collection
within the wooded
(SW) portion of the
site.
21 FEB 12
Direction: SE





Photo 3
EM61 Data collection
within the wooded (SW)
portion of the site.
21 FEB 12
Direction: SE



Photo 4
EM61 Data collection
around obstacles
(utility boxes), near
building 44H.
22 FEB 12
Direction: SE





Photo 5 EM61 data collection around building 44H. 23 FEB 12 Direction: SW



Photo 6 EM61 data collection around building 09031. 23 FEB 12 Direction: WSW





Photo 7 EM61 data collection around building 44A. 23 FEB 12 Direction: N



Photo 8
EM61 data collection around trees, east of buildings 44A and 09031.
23 FEB 12
Direction: NNE

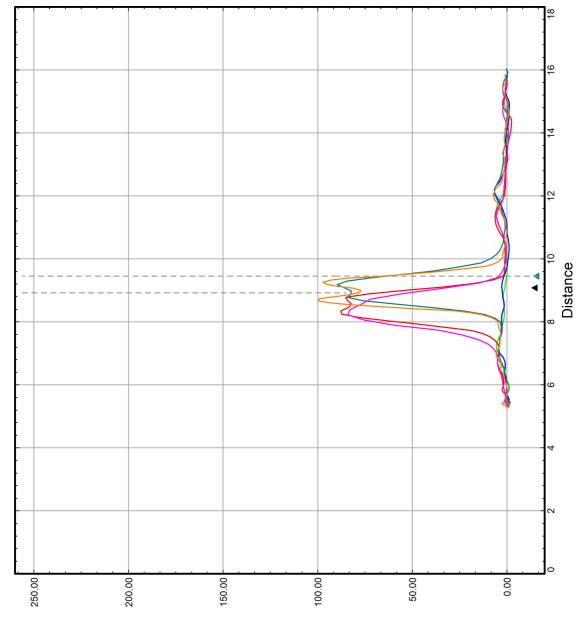


Section: APPENDIX A
Geophysical Report
Live Fire Shoot House
Fort Campbell, Kentucky

March 2012

## APPENDIX D Quality Control Figures

# 6-Line Test



database: c:\documents and settings\andri.hanson\my documents\geophys Channel: Ch3

# 6 line test MAP

# LEGEND

→ Normal Pace

→ Normal Pace with object - Normal Pace

Normal Pace with object

Fast Pace with object — Slow Pace with object

Target position

Lateral tol. exc.

Proposed distance lag = 0.281 Proposed time lag = 0.364 sec

Map Scale:



Client: KS Ware

Project: Fort Campbell Live Fire Shoot House

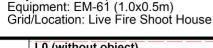
Contractor: AMEC / KS WARE

Created by: AEH	Verified by:
Date:	File: 20120221-6L_6LineTest
Page number:	Approved:

M0120

# Static Calibration A Test Project: Fort Campbell LFSH

W912QR-23413770 CERTIFIED FINAL-003 Allowable failure (%): 5% Page 394 of 947



-2

11:43:29.64

+2

-2

Exp'd

+4-Ch3\_RAW

11:43:44.60

L2 (without object)

11:43:59.56

11:44:14.52

Expected value: 0 Acceptable range: 5

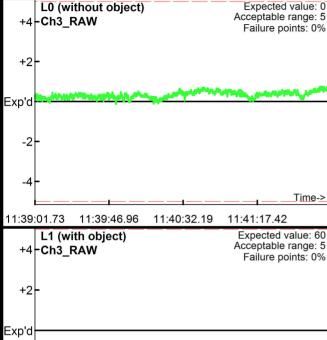
Failure points: 0%

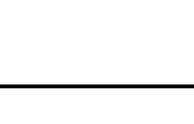
Time->

11:45 45.24

Outside range Operator: AH-MH
Acceptable limits Date: 2/21/2012

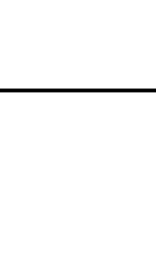
AM test







11:44 29.48

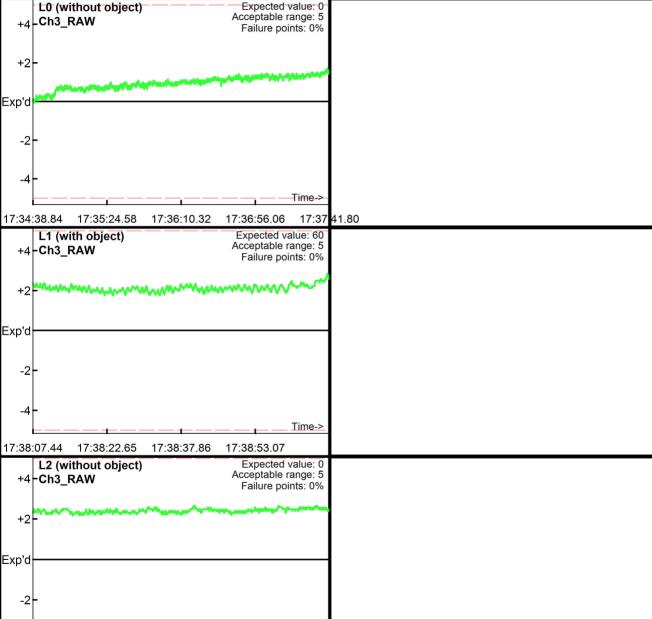


W912QR-23413770 CERTIFIED FINAL-003 Allowable failure (%): 5% Page 395 of 947

Project: Fort Campbell LFSH Equipment: EM-61 (1.0x0.5m) Grid/Location: Live Fire Shoot House

Outside range Operator: AH-MH Acceptable limits Date: 2/21/2012

PM test



Time->

17:40 22.38

17:40:07.15

17:39:36.69

17:39:21.46

Page: 1

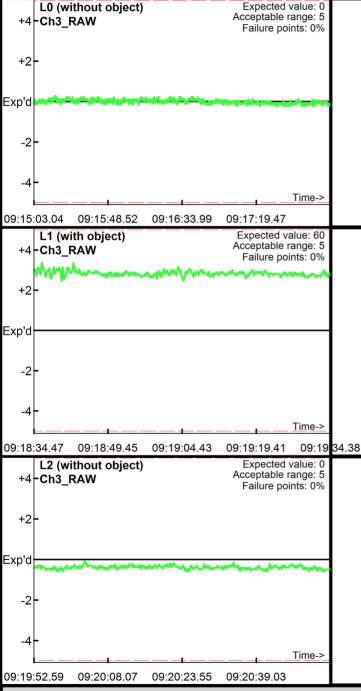
W912QR-23413770 CERTIFIED FINAL-003 Allowable failure (%): 5%Page 396 of 947

Project: Fort Campbell LFSH Equipment: EM-61 (1.0x0.5m) Grid/Location: Live Fire Shoot House

Outside range Acceptable limits

Operator: AH-MH Date: 2/22/2012

AM test



W912QR-23413770 CERTIFIED FINAL-003 Allowable failure (%): 5%Page 397 of 947

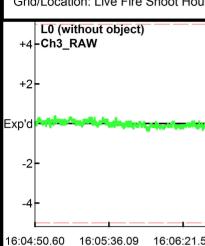
Equipment: EM-61 (1.0x0.5m) Grid/Location: Live Fire Shoot House

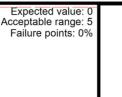
Project: Fort Campbell LFSH

Outside range Acceptable limits

Operator: AH-MH Date: 2/22/2012

PM test













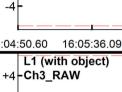


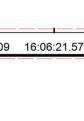








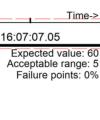




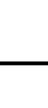
16:08:55.81

16:10:09.93

Database: C:Geosoft\QC\20120222-IRT-PM.gdb

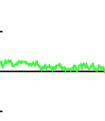


Time->









16:08:40.83

16:09:54.70

L2 (without object)

+2

Exp'd

-2

16:08:25.86

+2

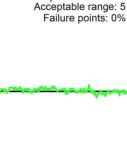
-2

16:09:39.47

Line Name: L0 L1 L2

Exp'd

+4-Ch3\_RAW



16:09:10.78

Expected value: 0

Failure points: 0%

Acceptable range: 5





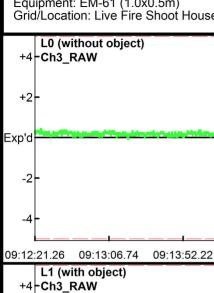
Time-> 16:10:25.16

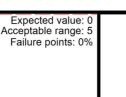
W912QR-23413770 CERTIFIED FINAL-003 Allowable failure (%): 5%Page 398 of 947 AM test Outside range Operator: AH-MH

Project: Fort Campbell LFSH Equipment: EM-61 (1.0x0.5m) Grid/Location: Live Fire Shoot House

Acceptable limits

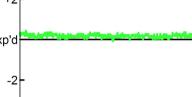
Date: 2/23/2012







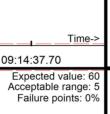


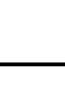


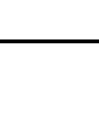


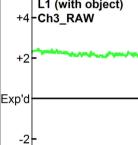






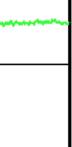




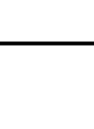


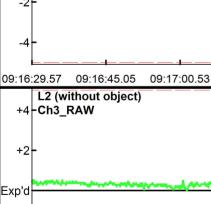
Exp'd

-2











Time->



## Static Calibration Test Project: Fort Campbell LFSH

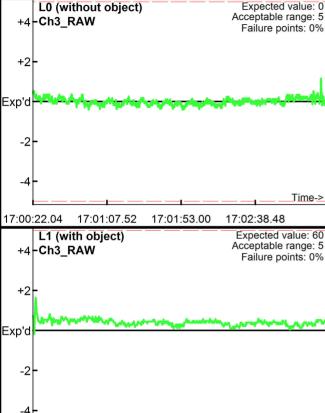
W912QR-23413770 CERTIFIED FINAL-003 Allowable failure (%): 5%Page 399 of 947 Outside range Operator: AH-MH

Equipment: EM-61 (1.0x0.5m) Grid/Location: Live Fire Shoot House L0 (without object)

Acceptable limits

Date: 2/23/2012

PM test



17:03:55.43

+2

-2

17:05:33.28

Line Name: L0 L1 L2

Exp'd

+4-Ch3\_RAW

17:04:11.67

17:05:49.50

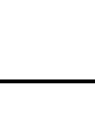
Database: Geosoft\QC\20120223-IRT-PM.gdb

L2 (without object)

17:04:27.91

17:06:05.72











Time->

Time->

17:04:44.14

17:06:21.94

Expected value: 0

Failure points: 0%

Acceptable range: 5





# Thursday, February 07, 2013

Geophysical Report Live Fire Shoot House Fort Campbell, Kentucky

Section: APPENDIX A

March 2012

## APPENDIX E EM61 Data - Electronic Only

## APPENDIX B List of Drawings

Section: APPENDIX B

Not Used

** REFER TO APPENDIX J FOR CONNECTION POINTS **

W912QR-23413770 CERTIFIED FINAL-003

Page 402 of 947

# APPENDIX D Results of Fire Flow Tests

Section: APPENDIX D

Not Used

## Draft Finding of No Significant Impact:

Section: APPENDIX E

Range and training Land Program - Development Plan Supplemental Environmental Assessment

Fort Campbell has prepared a Supplemental Environmental Assessment (SEA) that evaluates the potential environmental impacts associated with the Range and Training Land Program - Development Plan (RTLP-DP) update. During the preparation of the SEA, a number of alternatives and a no-action alternative were evaluated. This SEA evaluates the potential environmental effects of implementing proposed range development actions as defined in Section 2 of the SEA. After careful consideration, it was determined that only the proposed action would satisfy the Army's requirement without causing significant environmental impacts and incurring substantial additional costs. The attached SEA was prepared pursuant to 32 Code of Federal Regulations Part 651 and U.S. Council on Environmental Quality regulations (Title 40, U.S. Code, Parts 1500-1508) for implementing the procedural requirements of the National Environmental Policy Act.

#### Description of the Proposed Action

Fort Campbell proposes to implement 5 projects amended to the 2008 RTLP-DP SEA (Table1). Descriptions of amended projects are detailed in Section 2 of the SEA. The proposed projects are sited in areas categorized as range and training maneuver land. Although the proposed action converts dismounted training land to fixed facilities, the land will still be utilized for training purposes. The specific descriptions of the Proposed Action are described in the attached SEA.

#### No Action Alternative

Under the no action alternative, Fort Campbell would not implement any new project associated with the RTLP-DP. The existing training mission support activities at Fort Campbell would continue at their current level, location, and frequency. No new projects would be implemented to modernize, develop, relocate, or upgrade available training assets, although general maintenance activities or protection of training assets and other resources would continue to be implemented at current levels. Existing facilities would continue to be maintained in their current condition. The no action alternative will not meet the current or projected mission training requirements of the  $101^{st}$  Airborne Division and tenant units.

The no action alternative reduces mission training effectiveness and will not meet the current or projected mission training requirements of the 101<sup>st</sup> Airborne Division tenant units. Soldiers training to fight the GWOT would not be sufficiently trained in urban warfare tactics which potentially could increase loss of life.

# Table 1. Amended Project List for 2012 RTLP-DP SEA Fort Campbell, Kentucky

Section: APPENDIX E

Project Title	Location	Description
Training Area 48 Renovations	TA 48	Renovate and reconstruct 40 acres of firing points by terracing land, re-seeding barren areas, removing invasive species and woody encroachment, and land smoothing of existing ruts from past military activities.
Development of TA 21 UAS Asphalt Runway and Facilities	TA 21	Develop an asphalt runway, operations building, storage facilities for UASs, equipment maintenance facilities, and fueling stations within Training Area 21 to support UAS mission training.
Development of Fixed-Wing Runway in Veghel Drop Zone	TA 44A	Develop an asphalt runway in Training Area 44A to support aircraft training operations and enhance military efficiency of fixed-wing aircraft that launch/land unassisted horizontally on a short runway.
5th Special Forces Group Range51 Skid Pad and Helicopter Land Zone (HLZ)	TA 47	Develop a HLZ and a Range 51 Skid Pad for military vehicle operation training activities. The skid pad will be a paved concrete area on the designated site used for practicing ATV and other military vehicular maneuvers under simulated conditions for various situations.
5th Special Forces Group TA 47 Mobility Course	TA 47	Develop a mobility course for 5th Special Forces Group to provide critical mobility training and immediate response to potential situational threats. The course will facilitate the development of 5 <sup>th</sup> SFG mobility skills to and from objectives in low/high threat environments. Detailed mobility planning and implementation of these practices are essential to safely completing the mission.
Range 44 Live Fire Shoot House (LFSH) Development		Development of Range 44 to include the construction of a standard design Live Fire Shoot House to support mission training and operations requirements is necessary. The proposed action may include, but is not limited to the development of a Shoot House, After Action Review & Range Operations Control building, operations/storage building, ammunition breakdown building, and latrine.

#### **Environmental Consequences**

No significant negative environmental consequences were identified in the SEA as a result of the proposed action. Site selection minimized impacts to the greatest extent possible.

Implementation of the proposed action would result in less than significant impacts to land use. Although land use would change from maneuver land to permanent facilities, this would not change the overall training designation of the areas.

Impacts to air quality during construction activities would be temporary and less than significant. Increased storm water runoff from constructing impervious areas associated with new development would be expected to result in minor adverse effects on water resources. Adverse effects would be minimized following the protocols outlined in the Fort Campbell Policy for Storm Water Erosion and Sediment Control at Construction Projects and site-specific Storm Water Pollution Prevention Plans (SWPPPs). In addition, there would be displacement of wildlife, both temporary and permanent, from the construction and adjoining areas, but this would be minor as animals would acclimate to the areas into which they were originally displaced.

There would be a minor positive impact to the local economy resulting from construction-related jobs and construction-related purchases of supplies and materials.

There would be permanent negative impacts to land use, geology and soils, and vegetation, but these impacts would be localized and less than significant.

There would be no appreciable impacts on valued environmental components (air quality, cultural resources, noise, soil erosion, threatened and endangered species, wetlands, water resources, socioeconomics, energy, solid wastes, hazardous materials, land use, and transportation). No significant cumulative or indirect impacts would be expected to result from the proposed action.

#### Conclusion

Based on the analysis performed in this SEA, implementation of the proposed action wou	uld
have no significant direct, indirect, or cumulative effects on the quality of the natural and	1
human environment. Issuance of a Finding of No Significant Impact (FNSI) is appropria	ate.

JAMES C. MCCONVILLE	Date
Major General, USA	
Installation Commander	

# Range and Training Land Program -Development Plan Supplemental Environmental Assessment

Section: APPENDIX E

Prepared for

Fort Campbell, Directorate of Plans, Training, Mobilization, and Security Range Division

Prepared by

Fort Campbell, Directorate of Public Works Environmental Division, NEPA Program

April 2012

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#### **EXECUTIVE SUMMARY**

Fort Campbell has prepared a supplemental environmental assessment (SEA) to analyze the potential environmental and socioeconomic impacts of demolition and construction activities necessary to accommodate soldiers in various aspects of military training. Fort Campbell began implementing The Range and Training Land Development Program Development Plan (RTLP-DP) in 2004, (Fort Campbell, 2004). This document was developed in accordance with Army Regulation (AR) 210-21 and the associated RTLP Generic Methodology. The RTLP-DP provides a view of the available training assets, identifies the users, and establishes the training requirements based upon Army training doctrine and resource guidance. It establishes current requirements and utilization levels for available training assets and provides a near- and long-term project plan for training, public works, and environmental planners. The updated project list within the RTLP-DP supports training requirements for the Global War On Terrorism (GWOT), Iraqi Freedom, and Enduring Freedom. This Supplemental Environmental Assessment (SEA) evaluates the potential environmental effects of implementing proposed range development actions as defined in Section 2.

#### Purpose and Need

The purpose of the proposed action is to enhance the mission of the U.S. Army to defend and protect the United States and national interests at home and abroad. The need for the proposed action is to provide appropriate environments and support infrastructure to facilitate various aspects of military training for soldiers assigned to Fort Campbell.

#### Development Alternative (Proposed Action)

Fort Campbell proposes to continue ongoing projects in addition to two new projects amended to the 2012 RTLP-DP SEA listed in Table 1 on page 6 (Amended to 2005 RTLP-DP PEA) in specific range training areas. Because this Supplemental Environmental Assessment (SEA) was developed prior to development of specific site designs, the facility layouts are not known. However, generalized locations and descriptions of the proposed facility's footprints were available and analysis is based on the defined footprints.

The ongoing and future projects described in the 2012 RTLP-DP SEA are inclusive of, but not limited to:

- Training Area 48 Renovations and MOUT/Tunnel Construction
- Development of TA 21 UAS Asphalt Runway and Facilities
- Development of Fixed-Wing Runway in Veghel Drop Zone
- 5<sup>th</sup> Special Forces Group TA 47 Mobility Course
- 5<sup>th</sup> Special Forces Group Range 51 Skid Pad and Helicopter Land Zone (HLZ)
- Range 44 Live Fire Shoot House (LFSH) Development

### Training Area 48 Renovations and MOUT Facility/Tunnel Development

Section: APPENDIX E

The renovation of the Carentan Drop Zone in Training Area 48 (Figure 3) and development of a MOUT training facility and an underground tunnel system in this area are needed to provide realistic mission-related training environments and to ensure soldier readiness and efficiency. The proposed action includes reconstruction of 40-acres of existing firing points by terracing land, re-seeding barren areas, removal of invasive species (burning and mowing), land smoothing existing ruts and unrecovered artillery firing positions from past military operations, and removal of woody encroachment. Existing trails and gravel roads will be renovated and regraveled. The project will construct improved ditch lines and waterways for storm water management and construct access roads to the renovated firing points. Native plant species will be planted for sediment and erosion control, and support heavy use of vehicle/foot traffic. Also, training will be enhanced by constructing and operating a MOUT facility and associated Tunnel System. The MOUT type buildings will consist of concrete huts, courtyard walls, a tunnel system under and connecting huts and improved access roads (looping around MOUT/Tunnel) on eight acres of old field. Access roads will include traffic circles and secondary roads for IED training and convoy lanes. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basing, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Construction of a MOUT facility and tunnel system in TA 48 is necessary to support combat readiness in urban warfare.

#### Construct Un-manned Aircraft System (UAS) Training Area 21

Development of an asphalt runway, an operations building, UAS storage facilities, equipment maintenance facilities, and fueling stations within Training Area 21is proposed in order to support UAS mission training (Figure 4). The proposed actions will include developing an operations building (connected to the runway by asphalt), access roads, and gates on 20-acres of existing disturbed ground (maximum). Other improvements include developing a 1000ft Asphalt Flight Landing Strip (FLS) runway, taxiway, and associated access roads along Destiny Trail. Removal of trees within the glide slope located east and West of the FLS in Training Area 21 encompasses 10-acres. Glide slope hazard tree removal is required to facilitate FLS use by United States Army UAS aircraft and enhance helicopter air assault operations. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basins, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Native plant species will be planted for sediment and erosion, and support heavy use vehicle/foot traffic.

#### Construct Asphalt Fixed-Wing Runway Veghel Drop Zone (DZ) Training Area 44A

Development of an asphalt runway to support aircraft training to enhance military efficiency of fixed-wing aircraft that launch/land unassisted horizontally on a short runway in Veghel Drop Zone (DZ) Training Area 44A is required (Figure 5). Proposed actions will include developing an operations building (connected to the runway by asphalt), access roads, and gates on 20-acres (maximum) of existing disturbed ground. Other improvements include developing a 2000' Asphalt Flight Landing Strip (FLS) runway (197 ft x 3937 ft) including East and West glide slopes, taxiway, and associated access roads along Veghel Road within Training Area 44A.

Glide slope hazard tree removal is required to facilitate FLS use by United States Army fixed-wing aircraft and enhance helicopter air assault operations. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basins, grassed waterways, water turn-outs and rock checks for sediment and erosion control. Native plant

species will be planted for sediment and erosion, and support heavy use vehicle/foot traffic.

#### 5th Special Forces Group TA 47 Mobility Course

Section: APPENDIX E

Development of a mobility course for 5th Special Forces Group will provide critical mobility training and immediate response to potential situational threats (Figure 6). An all-terrain vehicle (ATV) track is required to provide realistic training of driver skills on paved and off-road conditions. This includes training for threat clearance and discovery techniques, as well as small arms threat and recovery skills. The course may include, but is not limited to a 2-mile off-road dirt course, multiple parking areas, a wet-track course, 328 ft x 984 ft range with a gravel access road, and the necessary operation and management facilities. No such mobility course exists on post and existing ranges do not support multi-faceted requirements of diverse ATV track techniques. The course will facilitate the development of 5<sup>th</sup> SFG mobility skills to and from objectives in low/high threat environments. Detailed mobility planning and implementation of these practices are essential to safely completing the mission.

#### Development of Helicopter Land Zone (HLZ) and Range 51 Skid Pad

Development of a Helicopter Land Zone (HLZ) and a Range 51 Skid Pad is required for efficient operation, landing, and departure of military aircraft and vehicles. The skid pad is a 750 ft x 200 ft designated paved area used for practicing maneuvers under simulated engine failure and other emergency situations in Training Area 47, at the base of Range 51E (Figure 7). The construction of the skid pad with a wet track for the 5<sup>th</sup> Special Forces Group will facilitate training for the operation of military vehicles in a variety of environmental conditions. The HLZ will be an 80 SF designated area in Range 51. This landing zone will support 2xMH47s and 1xOSPREY military aircraft. Development of the HLZ is essential in conducting helicopter infiltration and exfiltration mission profiles and collective training. The proposed action may include, but is not limited to development of a shotgun course, a shoot house, and operation facilities within the proposed project area. USASFC directed vender training be reduced at all levels. Fort Campbell and 5<sup>th</sup> Special Forces Group lack training sites with the capacity to provide advanced driving tactical techniques instructed by Gryphon Group Security Services.

#### Development of Range 44 Live Fire Shoot House (LFSH)

Development of Range 44 to include the construction of a standard design Live Fire Shoot House (LFSH) to support mission training and operations requirements is necessary. The proposed action may include, but is not limited to the development of a shoot house, After Action Review (AAR) & Range Operations Control (ROC) building, operations/storage building, ammunition breakdown building, and latrine. Supporting facilities to be developed on Range 44 include site improvements, gravel parking area, turnaround, HVAC, electric service, and information systems. Developments for the LFSH will include the shoot house (approximately 2,500 SF); shoot house canopy (approximately 4,500 SF); storage building (approximately 800 SF); AAR and ROC (approximately 1,000 SF total); ammo breakdown building (approximately 180 SF); latrine (approximately 200 SF). The existing shoot house and

K-Span will be demolished. The existing bleacher enclosure will remain in place. Existing gravel roads will be renovated and re-graveled as needed. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basins, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Native plant species will be planted for sediment and erosion control, and to support heavy use of vehicle/foot traffic.

#### No Action Alternative

Under the no action alternative, Fort Campbell would not implement any new project associated with the RTLP-DP. The existing training mission support activities at Fort Campbell would continue at their current level, location, and frequency. No new projects would be implemented to modernize, develop, relocate, or upgrade available training assets, although all existing plant and activities involving maintenance or protection of training assets and other resources would continue to be implemented at current levels. Existing facilities would continue to be maintained in their current condition. The no action alternative will not meet the current or projected mission training requirements of the 101<sup>st</sup> Airborne Division and tenant units.

The President's Council on Environmental Quality regulations (40 Code of Federal Regulations 1502.14(d)) for implementing the National Environmental Policy Act requires consideration of the no action alternative. Inclusion of the no action alternative serves as a benchmark for evaluating the potential effects of the proposed action. The no action alternative would not satisfy the need for the proposed action.

#### Alternatives Considered and Eliminated from Analysis

The 2005 RTLP-DP PEA identified two alternatives for implementation of the RTLP-DP, as well as a no action alternative. These alternatives, presented in the 2005 RTLP-DP PEA, are summarized as follows:

- Alternative 1. This alternative would have implemented a portion of new military construction and Integrated Training Area Management projects to increase maintenance and protection of range and training land assets. These projects would help to sustain the baseline conditions of the range and training land assets. If this alternative was implemented, Fort Campbell would continue to have shortfalls in meeting new range requirements and upgrading/modernizing existing ranges and training facilities to meet the training requirements of its users.
- Alternative 2. This alternative would have implemented several new projects identified in the RTLP-DP as well as those projects and activities included under Alternative 1. If this alternative was implemented, Fort Campbell would fulfill the requirements of the RTLP-DP. However, because new training requirements to meet the needs of the soldier fighting the GWOT have emerged since the plan was adopted, this alternative would not address new mission training requirements resulting in shortfalls in meeting new range requirements, upgrading/modernizing existing ranges, and training facilities to meet the mission training requirements of its users. For the reasons set out in the 2008 RTLP-DP SEA, the two were not found feasible and, accordingly, not evaluated in detail. The rationale for the elimination

from detailed analysis remains applicable because the drawbacks persist. Accordingly, those alternatives are not evaluated in detail in this SEA.

#### **Findings**

Section: APPENDIX E

#### Consequences of the Development Alternative (Proposed Action)

Implementation of the proposed action would result in minor adverse impacts to land use. The proposed action would result in a land use designation change from dismounted training land to permanent fixed facilities. No effects would be expected on surrounding land use. Current land uses around the proposed sites are compatible with the proposed action. Short-term minor adverse effects on air quality would occur as a result of construction activities. Critical pollutants from the use of construction equipment are expected and would be below the *de minimis* level. Short-term minor adverse effects to soils would be expected in construction areas. Increased runoff and erosion would likely occur during site construction due to removal of vegetation, exposure of soil, and increased susceptibility to wind and water erosion. However, these effects would be minimized by the use of appropriate best management practices (BMPs) for controlling runoff, erosion, and sedimentation. Several projects have been sited on locations with existing erosion problems. Construction at these locations would expect beneficial effects due to reduction of erosion and over land soil transport.

Short- and long-term minor adverse effects to water quality would be expected. In the short term, land clearing and construction activities could increase erosion as well as increase dissolved solid, sediment, and petroleum hydrocarbon content in the water. Long term impacts from increased storm water runoff would be expected to result in minor adverse effects on water resources. Increased stream sediment loads from increased vehicular crossings at newly constructed fords would be expected. Sediment from off-road tactical driving courses is expected to impact water quality at fords. Adverse impacts would be minimized by constructing cabled-concrete crossings, emplacing bank armor, and limiting use during inclement weather.

Short-term minor adverse effects to biological resources would occur as the result of the proposed action. Impacts to wildlife communities would be minor as the animals would be displaced during construction and disperse to other suitable areas. Vegetation would be removed during clearing for construction with native vegetation established on site following construction. Implementation of controls (NPDES, SWPPP), compliance with the installation's Endangered Species Management component and use of BMPs would ensure that endangered bat foraging areas within the rear training areas would not be adversely impacted.

Potential impacts to cultural sites either adjacent to or contained within a project's footprint will be addressed in subsequent NEPA documentations following the Fort Campbell NEPA procedure utilizing a Record of Environmental Consideration (REC) for each project defined within this analysis.

One action is included in the fiscal year 2009 Programmatic Agreement rewrite pertaining to cultural resources within the impact area. Cumulative impacts could result from incremental loss of habitat from conversion to other uses and incremental impacts to hydrology or water quality

resulting from increased impervious surfaces within the region. Development of green space within these project locations would reduce the potential impacts on the natural resources on Fort Campbell.

#### Consequences of the No Action Alternative

Section: APPENDIX E

Under the no action alternative, Fort Campbell would not implement any new project associated with the RTLP-DP. The existing training mission support activities at Fort Campbell would continue at their current level, location, and frequency. No new projects would be implemented to modernize, develop, relocate, or upgrade available training assets, although all existing plans and activities involving maintenance or protection of training assets and other resources would continue to be implemented at current levels. Existing facilities would continue to be maintained in their current condition. The no action alternative reduces mission training effectiveness and will not meet the current or projected mission training requirements of the 101st Airborne Division and tenant units. Soldiers training to fight the GWOT would not be sufficiently trained in urban warfare tactics which potentially could increase loss of life. There would be no impacts, positive or negative, to other resource areas.

## **CONTENTS**

Section: APPENDIX E

EXECUTIVE SUMMARY	ES-1
1.0 PURPOSE, NEED, AND SCOPE	1
1.1 Introduction	1
1.2 Purpose and Need for Proposed Action	1
1.3 Scope of Analysis	1-2
1.4 Agency and Public Participation	2
1.5 Regulatory Framework	3
1.5.1 Federal Statutes	3 3 3
1.5.2 Regulations	3
1.5.3 Executive Orders	3-4
2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES	7
2.1 Development Alternative (Proposed Action)	7
2.1.1 Training Area 48 Renovations and MOUT Facility Development	7
<ul><li>2.1.2 Development of an Un-Manned Aerial System (UAS) Training Area 21</li><li>2.1.3 Construct a Fixed-Wing Runway in Veghel Drop Zone</li></ul>	7
Training Area 44A	8
2.1.4 Development of 5th Special Forces Group TA 47 Mobility Course	8
2.1.5 Development of Helicopter Land Zone (HLZ) and Range 51 Skid Pad	8
2.1.6 Development of Range 44 Live Fire Shoot House (LFSH)	9
2.2 No Action Alternatives	17
2.3 Actions Eliminated from Consideration	17
3.0 AFFECTED ENVIRONMENT AND CONSEQUENCES	18
3.1 Valued Environmental Components	18
3.2 Land Use	18
3.2.1 Affected Environment	18
3.2.2 Consequences	18-19
3.3 Air Quality	19
3.3.1 Affected Environment	19
3.3.2 Consequences	19
3.4 Noise	21
3.4.1 Affected Environment	21-22
3.4.2 Consequences	22-23
3.5 Geology and Soils	23
3.5.1 Affected Environment	23
3.5.2 Consequences	23-24
3.6 Water Resources	24
3.6.1 Affected Environment	24
3.6.2 Consequences	24-25
3.7 Biological Resources	25
3.7.1 Affected Environment	25-26
3.7.2 Consequences	28

3.9	3.8 Cultural Resources 3.8.1 Affected Environment 3.8.2 Consequences Cumulative Effects	30 30 30-32 32
4.0 H	FINDINGS AND CONCLUSIONS 4.1 Findings 4.4 Conclusions	<b>33</b> 33 33
5.0 I	LIST OF PREPARERS	37
6.0 I	DISTRIBUTION LIST	37
7.0 I	LITERATURE CITED	38-39
8.0 A	ACRONYMS AND ABBREVIATIONS	40-42
	TABLES	
1	Amended Project List for 2012 RTLP-DP SEA Fort Campbell, Kentucky	6
2	National Ambient Air Quality Standards for Criteria Pollutants RTLP-DP SEA, Fort Campbell, Kentucky	20
3	Bird Species of Conservation Concern Occurring on Fort Campbell RTLP-DP SEA, Fort Campbell, Kentucky	29
4	Summary of Potential Environmental and Socioeconomic Consequences RTLP-DP SEA, Fort Campbell, Kentucky	34-36
	FIGURES	
1	Location of Fort Campbell Military Installation. RTLP-DP SEA	5
2	Proposed Action Project Locations on Fort Campbell Military Installation. RTLP-DP SEA	10
3	Proposed Renovations and MOUT Facility Development in Training Area 48. RTLP-DP SEA	11
4	Proposed UAS Asphalt Runway and Operations Building in Training Area 21. RTLP-DP SEA	12

Section: APPENDIX E	W912QR-23413770 CERTIFIED FINA
	Page 416 c

5	Proposed Fixed-wing Runway in Veghel Drop Zone in Training Area 44A. RTLP-DP SEA	13
6	Proposed Mobility Course for 5 <sup>th</sup> Special Forces Group in Training Area 47. RTLP-DP SEA	14
7	Proposed Skid Pad, Helicopter Land Zone, and Shotgun Assault Course for 5 <sup>th</sup> Special Forces Group on Range 51. RTLP-DP SEA	15
8	Proposed Live Fire Shoot House on Range 44. RTLP-DP SEA	16
9	Sensitive species records on Fort Campbell (includes federally listed bat records). RTLP-DP SEA	27

#### **APPENDICES**

Federally and State Listed Species Known to Occur in Montgomery County,  $\mathbf{A}$ Tennessee; Stewart County, Tennessee; Trigg County, Kentucky; Christian County, Kentucky

#### 1.0 PURPOSE, NEED, AND SCOPE

#### 1.1 INTRODUCTION

Fort Campbell is an Army installation located in southwestern Kentucky and north-central Tennessee (Figure 1). Fort Campbell has developed a Supplemental Environmental Assessment (SEA) to analyze the potential environmental and socioeconomic impacts of renovation, demolition, and construction activities necessary to meet the requirements of The Range and Training Land Development Program Development Plan (RTLP-DP). The RTLP-DP was updated in 2004, (Fort Campbell, 2004). This document was developed in accordance with Army Regulation (AR) 210-21 and the associated RTLP Generic Methodology. The RTLP-DP provides a view of the available training assets, identifies the users, and establishes the training requirements based upon Army training doctrine and resource guidance. It establishes current requirements and utilization levels for available training assets and provides a near- and long-term project plan for training, public works, and environmental planners. The updated project list within the RTLP-DP supports training requirements for the Global War On Terrorism (GWOT), Iraqi Freedom, and Enduring Freedom. This Supplemental Environmental Assessment (SEA) evaluates the potential environmental effects of implementing the updated project list for range development actions as defined in Section 2.

#### 1.2 PURPOSE AND NEED FOR PROPOSED ACTION

The purpose of the proposed action is to provide the 101st Airborne Division with adequate and improved training facilities to increase survivability in the combat theater. Operations within combat theaters in Iraq and Afghanistan have indicated additional training and facilities are required to increase soldier effectiveness and avoid loss of life. The proposed action is required to meet the ever changing needs of the modern soldier. Like all major military installations, Fort Campbell is subject to continuous mission changes. This is particularly true as the Department of the Army (DA) continues to downsize and consolidate operations in response to changing global security requirements. The range and training areas development process must be flexible to accommodate these changes, and this SEA has been developed to include new projects specifically designed to increase the survivability of the modern soldier. Without the continual modification in training activities and the associated support infrastructure provided by the current range and training area development process, military personnel at Fort Campbell would not be able to adapt their training methods and infrastructure in response to changing world-wide conditions and military contingencies. The original Programmatic Environmental Assessment (PEA) provided Fort Campbell with an established environmental baseline, and a documented programmatic review process that provides responsive environmental review of potential training mission and training infrastructure changes, while also ensuring compliance with the requirements of 32 CFR Part 651, AR 200-1, and other Army regulations.

#### 1.3 SCOPE OF ANALYSIS

This SEA has been developed in accordance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations issued by the President's Council on Environmental Quality (CEQ) and the Army. The purpose of the SEA is to inform decision

makers and the public of the likely environmental consequences of the proposed action and alternatives.

This SEA incorporates by reference Fort Campbell's March 2005 Final Programmatic Environmental Assessment in Support of the Fort Campbell Range and Training Land Development Plan (http://www.campbell.army.mil/env/rtlpea.pdf), (referred to as the 2005 RTLP-DP PEA) for the implementation of new projects of the Fort Campbell, Directorate of Plan, Training, and Mobilization, Range Division. To aid the reader, this SEA summarizes important, relevant information contained in the 2005 RTLP-DP PEA. The SEA identifies, documents, and evaluates the potential environmental effects of implementing the proposed action on Valued Environmental Components (VEC) per the Army's NEPA Guidance Manual dated May 2007. Section 2.0 describes the proposed action and sets forth alternatives to the proposed action, including a no action alternative, and explains why certain alternatives are not evaluated in detail. Section 3.0 describes existing environmental conditions at Fort Campbell that could be affected by the proposed action and identifies potential environmental effects that could occur upon implementation of each of the alternatives evaluated. Section 4.0 presents conclusions regarding the potential environmental effects of the proposed action. An interdisciplinary team of environmental scientists, planners, engineers, archaeologists, lawyers, and military technicians reviewed the proposed action in light of existing conditions and have identified relevant beneficial and adverse effects associated with the action. This SEA focuses on potential environmental effects likely to occur within the 3 project areas located throughout the training areas. This document analyzes direct effects (those caused by the proposed action and occurring at the same time and place) and indirect effects (those caused by the proposed action and occurring later in time or farther removed in distance but still reasonably foreseeable). The potential for cumulative effects is also addressed, and mitigation measures are identified where appropriate.

#### 1.4 AGENCY AND PUBLIC PARTICIPATION

The Army invites public participation in the analysis of the proposed action through the NEPA process. Consideration of the views and information provided by all interested parties promotes open communication and enables better decision-making. All agencies, organizations, and members of the public having an interest in the proposed actions, including minority, low-income, disadvantaged, and Native American groups, are urged to participate in the decision-making process. Public participation opportunities with respect to this SEA and decision-making on the proposed actions are guided by 32 CFR Part 651. When the environmental analysis is complete, the Final SEA and Draft Finding of No Significant Impact (FNSI) will be made available to the public for comment for a period of 30 days. At the end of the 30-day public review period, the Army will consider all comments submitted by individuals, agencies, or organizations. As appropriate, the Army may then execute the FNSI and proceed with implementation of the proposed actions. If it is determined that implementation of the proposed actions would result in significant impacts, the Army will publish a Notice of Intent (NOI) in the *Federal Register* to prepare an environmental impact statement (EIS) or cancel the proposed actions. Throughout this process, the public may obtain information on the status the SEA by contacting Mr. Gene Zirkle, Fort Campbell NEPA Program Manager, at 270-798-9854.

#### 1.5 REGULATORY FRAMEWORK

A decision to proceed with the proposed action rests on numerous factors such as mission requirements, schedule, availability of funding, and environmental considerations. In addressing environmental considerations, Fort Campbell is guided by 32 CFR 651, relevant statutes and their implementing regulations, and Executive Orders (EO's) establishing standards and providing guidance on environmental and natural resources management and planning. These include:

#### 1.5.1 Federal Statutes

- NEPA (42 United States Code [USC] 4321-4370)
- The Clean Air Act of 1977 and the Water Quality Act of 1987 (33 USC 1251 et seq., as amended)
- Noise Control Act of 1972 (42 USC 4901-4918)
- Endangered Species Act of 1973 (16 USC 1531-1543)
- Migratory Bird Treaty Act (16 USC 701, et seq.)
- National Historic Preservation Act of 1966 (16 USC 470 et seq., as amended)
- Archaeological Resources Protection Act of 1979 (16 USC 470)
- Native American Graves Protection and Repatriation Act (25 USC 3001)
- Toxic Substances Control Act (15 USC 2601 et seq., as amended)

#### 1.5.2 Regulations

- CEQ Regulations for Implementing NEPA( 40 CFR 1500-1508)
- Environmental Effects of Army Actions (32 CR 651)
- AR 210-20 Installation Master Planning
- AR 405-70 Utilization of Real Property
- Protection of Historic Properties (36 CFR 800)

#### 1.5.3 Executive Orders

• EO 11988 (Floodplain Management)

- EO 11990 (*Protection of Wetlands*)
- EO 12088 (Federal Compliance with Pollution Control Standards)
- EO12580 (Superfund Implementation)
- EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)
- EO 13045 (Protection of Children from Environmental Health Risks and Safety Risks)
- EO 13101 (Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition)
- EO 13123 (Greening the Government Through Efficient Energy Management)
- EO 13148 (Greening the Government Through Leadership in Environmental Management)
- EO 13175 (Consultation and Coordination with Indian Tribal Governments)
- EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)

Where useful for better understanding, key provisions of these statues and Executive Orders are described in more detail in the text of this SEA. The full text of the laws, regulations, and EOs is available on the Defense Environmental Network & Information Exchange website at http://www.denix.osd.mil.

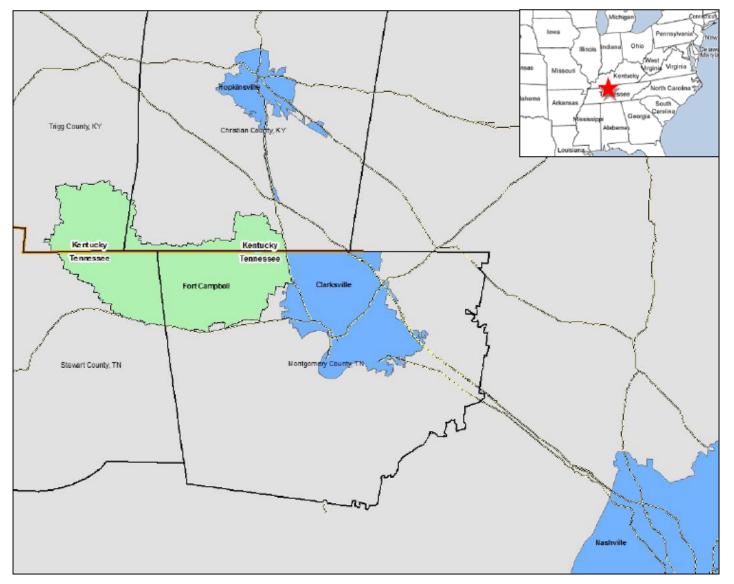


Figure 1. Location of Fort Campbell Military Installation. RTLP-DP SEA

Table 1. Amended Project List for 2012 RTLP-DP SEA Fort Campbell, Kentucky

Project Title	Location	Description
Training Area 48 Renovations	TA 48	Renovate and reconstruct 40 acres of firing points by terracing land, re-seeding barren areas, removing invasive species and woody encroachment, and land smoothing of existing ruts from past military activities.
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Range 44 Live Fire Shoot House (LFSH) Development		Development of Range 44 to include the construction of a standard design Live Fire Shoot House to support mission training and operations requirements is necessary. The proposed action may include, but is not limited to the development of a Shoot House, After Action Review & Range Operations Control building, operations/storage building, ammunition breakdown building, and latrine.

#### 2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This SEA evaluates the implementation of proposed projects amended to the RTLP-DP in order to provide the training infrastructure required to support both current and future training activities. All proposed actions are contained within the training lands of Fort Campbell (Figure 2).

#### 2.1 DEVELOPMENT ALTERNATIVE (PROPOSED ACTION)

#### 2.1.1 Training Area 48 Renovations and MOUT Facility Development

Renovation of the Carentan Drop Zone in Training Area 48 (Figure 3) is necessary to fulfill mission training requirements. The proposed action includes reconstruction of 40-acres of existing firing points by terracing land, re-seeding barren areas, removal of invasive species (burning and mowing), land smoothing existing ruts and unrecovered artillery firing positions from past military operations and removal of woody encroachment. Existing trails and gravel roads will be renovated and re-graveled. The project will also construct improved ditch lines and waterways for storm water management and construct access roads to the renovated firing points. Native plant species will be planted for sediment and erosion control, and to support heavy use of vehicle/foot traffic. Also, training will be enhanced by constructing and operating a MOUT facility and associated Tunnel System. The MOUT type buildings will consist of concrete huts, courtyard walls, an underground tunnel system connecting huts, and improved access roads (looping around MOUT/Tunnel) on 8-acres of old field. Access roads will include traffic circles and secondary roads for IED training and convoy lanes. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basing, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Construction of a MOUT facility and an underground tunnel system in TA 48 is necessary to support combat readiness in urban warfare.

#### 2.1.2 Development of Un-manned Aerial System (UAS) Training Area 21

Development of an asphalt runway, operations building, facilities for storage of UASs, and equipment maintenance and fueling stations within Training Area 21 to support UAS mission training and operations is required (Figure 4). The proposed action will include developing an operations building (connected to runway by infiltration and exfiltration mission profiles and collective training). Improvements will include developing a 1000ft Asphalt Flight Landing Strip (FLS) runway, taxiway, and associated access road along Destiny Trail. Development of the UAS will require the removal of trees within the glide slope located east and west of the FLS in Training Area 21, and encompasses 10-acres. Glide slope hazard tree removal is required to facilitate FLS use by United States Army UAS aircraft to enhance air assault operations. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basins, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Native plant species will be planted for sediment and erosion and to support heavy use of vehicle/foot traffic.

#### 2.1.3 Construct Asphalt Fixed-Wing Runway Veghel Drop Zone (DZ) Training Area 44A

Development of an asphalt runway to support aircraft training and enhance military efficiency of fixed-wing aircraft that launch/land unassisted horizontally on a short runway in Veghel Drop Zone (DZ) Training Area 44A (Figure 5) is required. The proposed action will include developing an operations building (connected to the runway by asphalt), access roads, and gates on 20-acres (maximum) of existing, disturbed ground. Other improvements include developing an asphalt Flight Landing Strip (FLS) (2000 ft) and a runway (197 ft x 3937 ft), including East/West glide slopes and taxiway, as well as associated access roads along Veghel Road within Training Area 44A. Glide slope hazard tree removal is required to facilitate FLS use by United States Air Force fixed-wing aircraft and enhance air assault operations. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basins, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Native plant species will be planted for sediment and erosion, and to support heavy use of vehicle/foot traffic.

#### 2.1.4 Development of 5th Special Forces Group TA 47 Mobility Course

Development of a mobility course for 5th Special Forces Group will provide critical mobility training and immediate response to potential situational threats (Figure 6). An all-terrain vehicle (ATV) track is required to provide realistic training of driver skills on paved and off-road conditions. This includes training for threat clearance and discovery techniques, as well as small arms threat and recovery skills. The course may include, but is not limited to a 2-mile off-road dirt course, multiple parking areas, a wet track, 328 ft x 984 ft range with a gravel access road, and the necessary operation and management facilities. No such mobility course exists on Fort Campbell and existing ranges do not support multi-faceted requirements of diverse ATV track techniques. The course will facilitate the development of 5<sup>th</sup> SFG mobility skills to and from objectives in low/high threat environments. Detailed mobility planning and implementation of these practices are essential to safely completing the mission. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basins, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Native plant species will be planted for sediment and erosion and to support heavy use of vehicle/foot traffic.

#### 2.1.5 Development of Helicopter Land Zone (HLZ) and Range 51 Skid Pad

Development of a Helicopter Land Zone (HLZ) and a Skid Pad in Range 51 is required for efficient operation, landing, and departure of military aircraft and vehicles (Figure 7). The skid pad is a 750 ft x 200 ft designated paved area used for practicing maneuvers under simulated engine failure and other emergency situations in Training Area 47, at the base of Range 51E. The construction of the skid pad with a wet track for the 5<sup>th</sup> Special Forces Group will facilitate training for the operation of military vehicles in a variety of environmental conditions. The HLZ will be an 80 ft x 80 ft designated area in Range 51. This landing zone will support 2xMH47s and 1xOSPREY military aircraft. The proposed action may include, but is not limited to development of a shotgun course, a shoot house, and operation facilities within the proposed project area. USASFC directed vender training be reduced at all levels. Fort Campbell and 5<sup>th</sup> Special Forces Group currently lack training sites with the capacity to provide advanced driving tactical techniques instructed by Gryphon Group Security Services.

#### 2.1.6 Development of Range 44 Live Fire Shoot House (LFSH)

Development of Range 44 to include the construction of a standard design Live Fire Shoot House (LFSH) to support mission training and operations requirements is necessary (Figure 8). The proposed action may include, but is not limited to the development of a shoot house, After Action Review (AAR) & Range Operations Control (ROC) building, operations/storage building, ammunition breakdown building, and latrine. Supporting facilities to be developed on Range 44 include site improvements, gravel parking area, turnaround, HVAC, electric service, and information systems. Developments for the LFSH will include the shoot house (approximately 2,500 SF); shoot house canopy (approximately 4,500 SF); storage building (approximately 800 SF); AAR and ROC (approximately 1,000 SF total); ammo breakdown building (approximately 180 SF); latrine (approximately 200 SF). The existing shoot house and K-Span will be demolished. The existing bleacher enclosure will remain in place. Existing gravel roads will be renovated and re-graveled as needed. Construction includes development of storm water controls utilizing existing ditch lines, temporary sediment basins, grassed waterways, water turn-outs, and rock checks for sediment and erosion control. Native plant species will be planted for sediment and erosion control, and to support heavy use of vehicle/foot traffic.

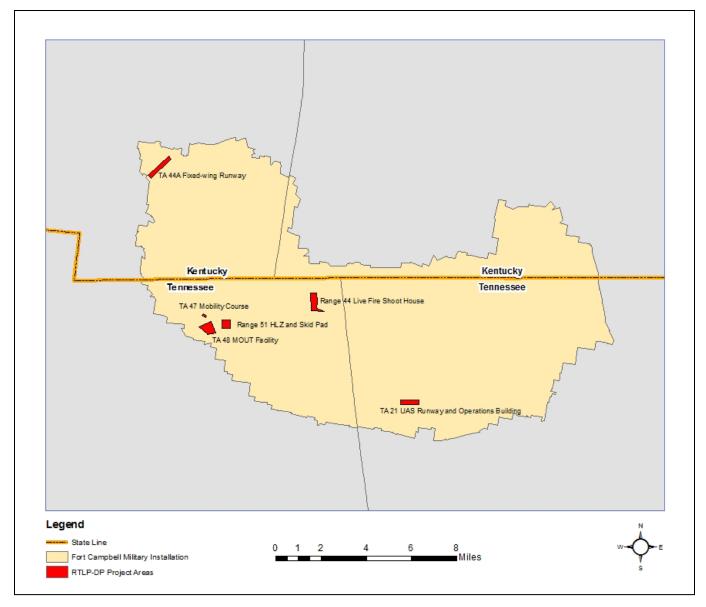


Figure 2. Proposed Action Project Locations on Fort Campbell Military Installation. RTLP-DP SEA

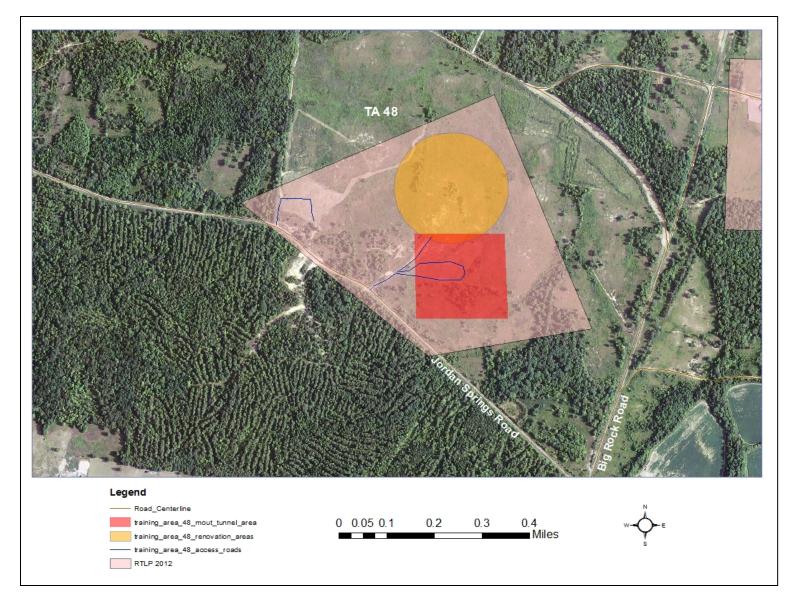


Figure 3. Proposed Renovations, MOUT Facility, and Tunnel Development in Training Area 48. RTLP-DP SEA

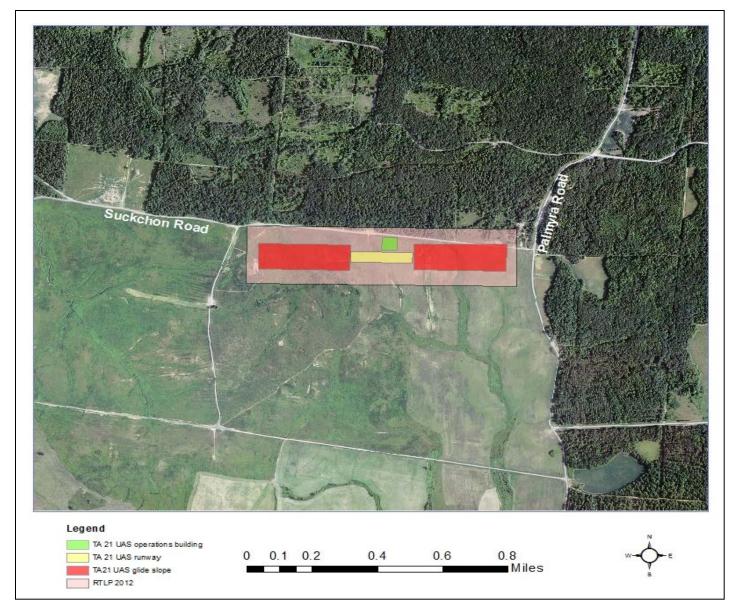


Figure 4. Proposed UAS Asphalt Runway and Operations Building in Training Area 21. RTLP-DP SEA

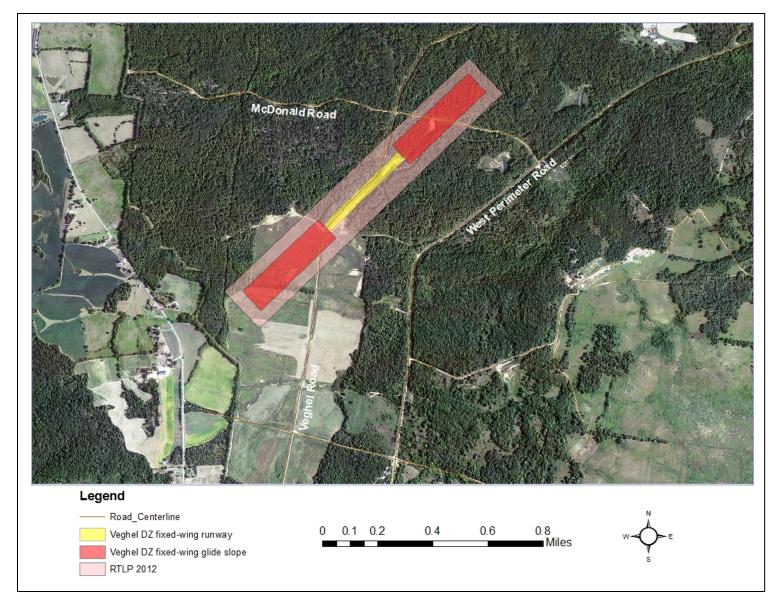


Figure 5. Proposed Fixed-wing Runway in Veghel Drop Zone in Training Area 44A. RTLP-DP SEA

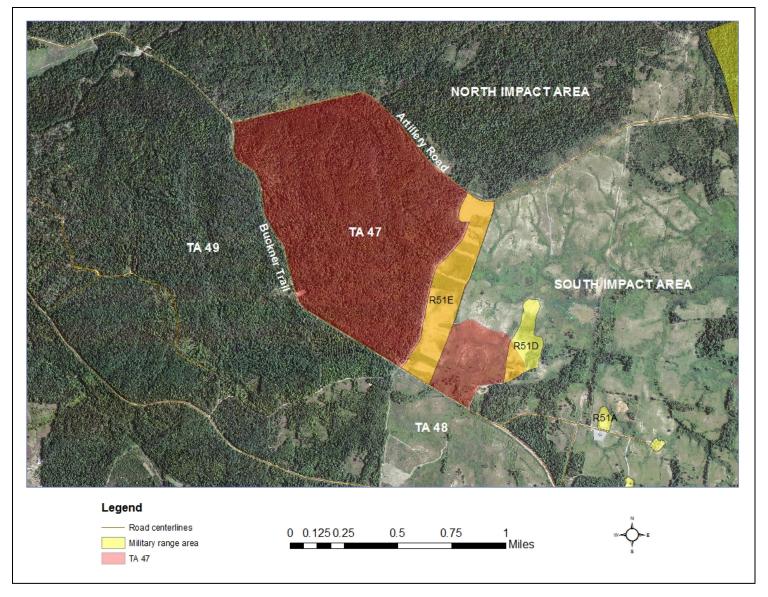


Figure 6. Proposed Mobility Course for 5<sup>th</sup> Special Forces Group in Training Area 47. RTLP-DP SEA

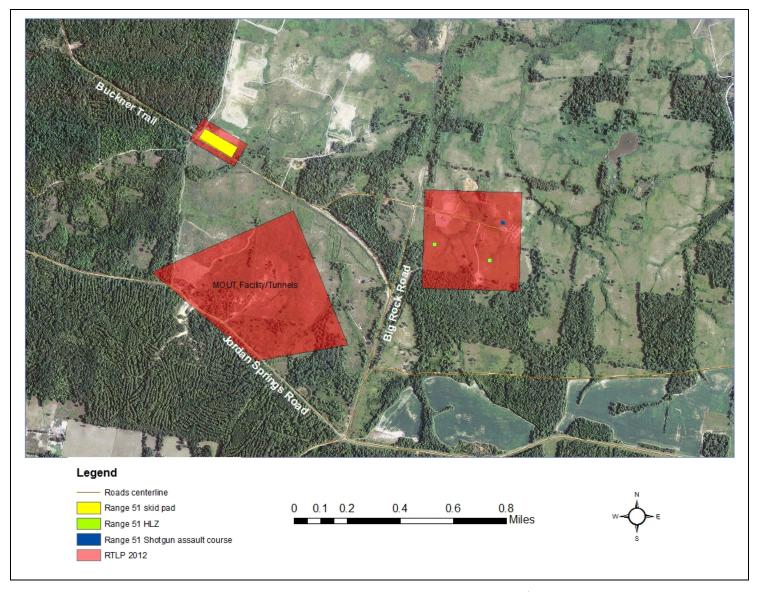


Figure 7. Proposed Skid Pad, Helicopter Land Zone, and Shotgun Assault Course for 5<sup>th</sup> Special Forces Group on Range 51. RTLP-DP SEA



Figure 8. Proposed Live Fire Shoot House on Range 44. RTLP-DP SEA

#### 2.2 NO ACTION ALTERNATIVES

Inclusion of the no action alternative is prescribed by CEQ regulations. The no action alternative serves as a baseline against which the impacts of the proposed action and alternatives can be evaluated. Under the no action alternative, Fort Campbell would not implement any new project associated with the RTLP-DP. The existing training mission support activities at Fort Campbell would continue at their current level, location, and frequency. No new projects would be implemented to modernize, develop, relocate, or upgrade available training assets, although general maintenance activities or protection of training assets and other resources would continue to be implemented at current levels. Existing facilities would continue to be maintained in their current condition. The no action alternative will not meet the current or projected mission training requirements of the 101st Airborne Division and tenant units. The no action alternative reduces mission training effectiveness and will not meet the current or projected mission training requirements of the 101st Airborne Division and tenant units. Soldiers training to fight the GWOT would not be sufficiently trained in urban warfare tactics which could potentially increase loss of life.

#### 2.3 ALTERNATIVES ELIMINATED FROM CONSIDERATION

The 2005 RTLP-DP PEA identified two alternatives for implementation of the RTLP-DP, as well as a no action alternative. These alternatives, also presented in the 2008 RTLP-DP SEA, are summarized as follows:

- Alternative 1. This alternative would have implemented a portion of new military construction and Integrated Training Area Management projects to increase maintenance and protection of range and training land assets. These projects would help to sustain the baseline conditions of the range and training land assets. If this alternative were implemented, Fort Campbell would continue to have shortfalls in meeting new range requirements and upgrading/modernizing existing ranges and training facilities to meet the training requirements of its users.
- Alternative 2. This alternative would have implemented several new projects identified in the RTLP-DP as well as those projects and activities included under Alternative 1. If this alternative was implemented, Fort Campbell would fulfill the requirements of the RTLP-DP SEA. However, new training requirements to meet the needs of the soldier fighting the GWOT have emerged since the plan was adopted, and this alternative would not address the new mission training requirements. This would result in deficiencies in meeting new range requirements and upgrading/modernizing existing ranges and training facilities to meet the mission training requirements of its users. For the reasons set out in the 2008 RTLP-DP SEA, the two were found insufficient and, accordingly, not evaluated in detail. The rationale for the elimination from detailed analysis remains applicable because the drawbacks persist. Accordingly, those alternatives are not evaluated in detail in this SEA.

# 3.0 AFFECTED ENVRIONMENT AND CONSEQUENCES

This SEA incorporates Fort Campbell's 2008 RTLP-DP SEA by reference

(http://www.campbell.army.mil/env/rtlpea.pdf). This section updates information that has changed since 2008 and evaluates new potential impacts to valued environmental components (VEC) from the proposed action. Table1 lists amended RTLP-DP projects and potential impacts to VEC. All environmental resources and conditions are evaluated for their potential environmental effects based upon the 2008 RTLP-DP SEA. Resource areas with impacts not evaluated or impacts that are potentially greater than the SEA analysis are addressed. This section is concluded by addressing cumulative effects and potential mitigation actions.

#### 3.1 VALUED ENVIRONMENTAL COMPONENTS

Fort Campbell is the third largest military population in the Army and the seventh largest in the DoD. Fort Campbell is the home of the Screaming Eagles of the 101<sup>st</sup> Airborne Division and several tenant units. Fort Campbell's primary mission is to advance the combat readiness of the 101<sup>st</sup> Airborne Division and the nondivisional units at the installation through training, mobilization, and deployment. Deployable military resources include combat-equipped soldiers, tactical vehicles, weapons, ammunition, and logistical equipment to sustain thousands of soldiers in a tactical environment for extended periods of time. The installation serves as a Power Projection Platform for the Army and for major Special Operations Command units.

To fulfill its mission, Fort Campbell maintains 48 live-fire ranges, 3 high-impact areas, 51 training areas, 5 drop zones, 93 artillery firing points, 51 maneuver areas, a special operations training center, and 2 airfields.

The following sections provide general descriptions of the physical and biological environment and regional socioeconomic conditions for the Fort Campbell RTLP-DP SEA.

#### 3.2 LAND USE

#### 3.2.1 Affected Environment.

A detailed description of Fort Campbell land use is provided in the 2005 RTLP-DP PEA and is incorporated into this SEA by reference. Information on land use specific to the proposed project sites is provided in the following paragraphs. The proposed projects are sited in areas categorized as range and training maneuver land. It is anticipated that 1,273-acres will be converted to fixed training facilities. Although the proposed action converts dismounted training land to fixed facilities, the land will still be utilized for training purposes.

#### 3.2.2 Consequences

Long-term minor adverse effects would be expected. The proposed action would result in a land use designation change from dismounted training land to permanent fixed facilities. Fort Campbell has about 65,794 acres of training land (INRMP, 1999). Conversion of 60 acres total from all projects located outside existing range facilities, to fixed facilities would result in a .09 percent loss of dismounted training land.

The loss of training land acreage would be very small relative to the total acreage available for training, and because the project sites would still be used for training, the effects on training land use would be less than significant. No effects would be expected on surrounding land use. Current land uses around the proposed sites are compatible with the proposed action. No effects would occur with implementation of the no action alternative. There would be no change in land use of the proposed sites.

### 3.3 AIR QUALITY

#### 3.3.1 Affected Environment

A detailed description of local and regional air quality conditions is provided in the 2008 RTLP-DP SEA and is incorporated into this SEA by reference. However, changes in the attainment status for Christian County, Kentucky, and Montgomery County, Tennessee, have occurred since completion of the 2005 RTLP-DP PEA. The U.S. Environmental Protection Agency (EPA) designated both counties basic nonattainment areas for ozone in June 2004. In November 2005, Montgomery County was re-designated an attainment area, but it will remain classified as an ozone maintenance area for the next 12 years. Christian County was re-designated as a maintenance area for ozone in January 2006 and will be required to follow the approved maintenance plan as well. The maintenance plan requirements are designed to maintain the average ozone concentration levels at or below the maximum allowed concentration to sustain compliance with the NAAQS (Patty Lockard, personal communication). During the maintenance period, Fort Campbell Directorate of Public Works must ensure that all on-post construction activities will not impede the continuation of the maintenance status, under the General Conformity Rule (GCR) (Fort Campbell Environmental Division, 2005; Patty Lockard, personal communication). This is done through issuance of a Record of Non-Applicability (RONA), establishing that the requirements of the General Conformity Rule do not apply to a specific action or through analysis of the best management practices (BMP) for the action that any pollutants of concern generated would not exceed established *de minimis* levels (Table 2) (Polyak and Webber, 2002). All construction projects are reviewed by the Environmental Division to ensure that construction and operating permits are applied for prior to construction activities. A detailed description of ongoing operations and associated emissions and air permits at Fort Campbell is provided in the 2005 RTLP-DP PEA and is incorporated into this SEA by reference.

#### 3.3.2 Consequences

Short-term minor adverse effects on air quality would occur as a result of construction activities. The projects would involve land clearing, ground leveling, utility installation, facility construction. These operations would involve the use of construction vehicles and equipment that emit criteria pollutants. Particulate matter (fugitive dust) could also be expected during construction activities. Fugitive dust emissions would be minimized by common construction practices such as periodically wetting construction areas, covering open equipment used to transport materials likely to create air pollution, and promptly removing spilled or tracked dirt from paved roads. No effects would occur with implementation of the no action alternative.

Table 2. National Ambient Air Quality Standards for Criteria Pollutants RTLP-DP SEA, Fort Campbell, Kentucky

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm (10mg/m³)	8-hour <sup>1</sup>	None
	35 ppm (40 mg/m <sup>3</sup> )	1-hour <sup>1</sup>	None
Lead	$1.5 \mu g/m^3$	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm $(100 \ \mu g/m^3)$	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter	$50.0~\mu g/m^3$	Annual <sup>2</sup> (Arithmetic Mean)	Same as Primary
$PM_{10}$	$150.0~\mu g/m^3$	24-hour <sup>1</sup>	
$PM_{2.5}$	$15.0~\mu g/m^3$	Annual <sup>3</sup> (Arithmetic Mean)	Same as Primary
	$65 \mu g/m^3$	24-hour <sup>4</sup>	
Ozone	0.08 ppm	8-hour <sup>5</sup>	Same as Primary
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	
	0.14 ppm	24-hour <sup>1</sup>	
		3-hour <sup>1</sup>	$0.55$ ppm $(1300\mu g/m^3)$

<sup>&</sup>lt;sup>a</sup> Not to be exceeded more than once per year.

Source: (EPA, 2007)

<sup>&</sup>lt;sup>b</sup> Revoked; due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM 10 standard in 2006 (effective December 17<sup>th</sup>, 2006).

<sup>&</sup>lt;sup>c</sup> Three-year average of the weighted annual mean PM  $_{2.5}$  concentrations from single or multiple community-oriented monitors must not exceed 15.0  $\mu$ g/m³.

<sup>&</sup>lt;sup>d</sup> Three-year average of the  $98^{th}$  percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35  $\mu$ g/m³ (effective December  $17^{th}$ , 2006).

<sup>&</sup>lt;sup>e</sup> Three-year average of the fourth highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

#### 3.4 NOISE

# 3.4.1 Affected Environment

To determine the impacts of noise on human receptors, noise measurements are weighted to increase the contribution of noises within the normal range of human hearing and decrease the contribution of noises outside the normal range of human hearing. For human, this is considered an A-weighted scale (dBA). When sound pressure doubles, the dBA level increases by 3. Most humans perceive a doubling of sound as an increase of 10 dBA (EPA, 1974). Sound pressure decreases with distance from the source. Typically, the amount of noise is halved as the distance from the source doubles (EPA, 1974).

Training and aviation activities are the primary sources of noise at Fort Campbell. Most ground training activities are conducted form Monday through Friday between 7 a.m. and 8 p.m. The Small Arms Impact Area is located in the eastern portion of the installation. Heavy weapons firing is conducted in the North/South Impact Area, located in the western portion of the installation. Blast noises emanate from several demolition areas located in the central portion of the installation.

The primary sources of noise are fixed-and rotary-wing aircraft operations and heavy weapons firing. Airfields on the installation include Campbell Army Air Field (CAAF), Destiny Heliport, and Sabre Heliport. Approximately 400 rotary-wing aircraft are stationed at Fort Campbell and are used extensively throughout the training areas, as well as areas adjacent to the installation. These flights are a substantial component of the military training and operations conducted principally by the 101<sup>st</sup> Airborne Division.

Fort Campbell published an Environmental Noise Management Plan (ENMP) in November 2000. The ENMP provides a written plan for current and future noise management at Fort Campbell. The ENMP replaced the use of Installation Compatible Use Zones (ICUZs). The ENMP incorporated the baseline developed for ICUZs with a strategic guide to implement noise education, complaint management, noise and vibration mitigation, and noise abatement procedures.

Through the ENMP, Fort Campbell identified noise zones that depict the relationship between noise levels and land use. The noise zones of Fort Campbell are defined as follows:

- Zone I: The sound level is less than 65 decibel (dB) A-weighted day/night level (ADNL), or 62 dB, C-weighted day/night level (CDNL). This zone, considered to have moderate to minimal noise exposure, is acceptable for noise-sensitive land uses.
- Zone II: The sound level is 65 to 75 dB ADNL or 62 to 70 dB CDNL. This zone is
  considered to have significant noise exposure and is normally unacceptable for noisesensitive land uses.
- Zone III; The sound level is grater that 75 dB ADNL or 70 dB CDNL. This zone is considered an area of severe noise exposure and is unacceptable for noise-sensitive activities (Fort Campbell, 1999).

The ENMP fosters communication between Fort Campbell and its civilian neighbors and provides a method for responding to civilian issues related to noise generated by training

activities. Other goals of the ENMP include education of installation personnel and surrounding residents, management of noise complaints, mitigation of noise and vibration, and noise abatement procedures. Noise monitoring systems and data management are also included in the plan. The ENMP can be obtained from the Fort Campbell Directorate of Public Works, Environmental Division (Fort Campbell, 2004b).

#### 3.4.2 Consequences

The proposed action encompasses projects that would take place in Zone II/Zone III area (Fort Campbell, 1999). Construction noise levels will be above background levels, not including aircraft flyovers. Heavy equipment such as bulldozers, graders, backhoes, excavators, dump trucks, and cement trucks will generate noise that could affect the onsite workers. Construction equipment typically emits noise in the 86-94 dB range. Construction workers will use hearing protection and follow the Occupation 1 Safety and Health Administration (OSHA) standards and procedures.

Noise created by the operation of unmanned aerial vehicles (UAVs) is expected to be within the normal levels of current aircraft operations at other UAS sites. Noise estimates for the ER/MP Sky Warrior at idle are 81-dB or less at a distance of 50 feet. Noise estimates for the EP/MP Sky Warrior at full throttle are 104-dB or less at a distance of 50 feet (Wood, 2009). This intermittent noise exposure could be a nuisance, but will not pose a threat to hearing. Any noise impacts for UV operations will be minor to negligible. No shifts in existing noise contours will occur. No long-term indirect or cumulative noise impacts are expected from ER/MP Sky Warrior operations. All personnel involved in close proximity to air operations in the proposed project areas will use hearing protection and follow OSHA standards and procedures.

Personnel stationed at outdoor posts in the vicinity of construction of UAS, HLZ, and Fixed-Wing Aircraft operations may be exposed to sound levels that could damage hearing. The hearing risk will be analyzed and personnel will be provided with hearing protection if warranted by the exposure noise level for any outdoor posts near the construction or aircraft operations area.

Aircraft operations personnel located within the operational facilities could also be affected by construction. Fort Campbell requires that structures in the Zone II/Zone III areas be designed and constructed with noise reduction insulation. The use of appropriate insulation for noise abatement will prevent adverse impacts resulting from UAS, HLZ, and the Fixed-Wing Aircraft developments and associated training activities. Noise abatement insulation will result in a 25% noise reduction and allow routine work within the buildings to proceed without interruption. The impact of additional aircraft operations will be minor.

The proposed action will occur outside the Fort Campbell cantonment area, limiting exposure to most Fort Campbell personnel and residents. Direct exposure to non-construction staff will be temporary and primarily limited to when personnel will be traveling on roads adjacent to the site or working within the site vicinity. This intermittent exposure could be a nuisance, but will not pose a threat to hearing. Noise generated during construction activities will likely dissipate before reaching the post boundary and will not affect the general public. Any impacts from construction will be temporary and minor to negligible.

The annual air emissions for the original RTLP-DP project were calculated in the 2005 RTLP-DP PEA. Those values were well below the *de minimis* levels listed in Table 2. Because the proposed action in this SEA is on a much smaller scale and distributed throughout the maneuver areas, emissions from the additional projects would also be insignificant and would meet the requirements of the General Conformity Rule.

Under the no action alternative, no new projects would be implemented. Therefore, there would be no effects on air quality.

#### 3.5 GEOLOGY AND SOILS

## 3.5.1 Affected Environment

A detailed description of geology and soils on Fort Campbell is provided in the 2008 RTLP-DP SEA and is incorporated into this SEA by reference. Information on geology and soil conditions specific to the proposed project sites is provided in the following paragraphs. The United States Department of Agriculture (USDA) soil map for Fort Campbell identifies 30 soil mapping units on the installation. The major soil associations are Pembroke-Crider, Nicholson, and Dickson-Mountview (Fort Campbell, 1999). Pembroke-Crider soils are found in areas identified as barrens on the eastern side of the installation. Nicholson soils are found on ridges, plateaus, and slopes adjacent to streams. Dickson-Mountview soils are found on the gently rolling plains that constitute the majority of the installation.

Soil information for Fort Campbell indicates that the potential for erosion for over half of the soil mapping units on the installation is moderate to severe. Because of a high degree of topographic variation within soil mapping units, there is considerable variation in erosion potential among locations within units. Most problems associated with soil erosion on Fort Campbell result from the removal of vegetation on moderate to severe slopes or on long gradual slopes (BHATE Environmental Associates, Inc., 2004). The proposed actions contain 5 projects located throughout a wide range of soil conditions. Projects located on the eastern half of the installation occur on level to gentle slopes, which reduce the erosion potential for these soils. Projects on the western half of the installation have an increased potential for erosion and ultimately soil loss.

#### 3.5.2 Consequences

Short-term minor adverse effects would be expected in construction areas. Increased runoff and erosion would likely occur during site construction due to removal of vegetation, exposure of soil, and increased susceptibility to wind and water erosion. However, these effects would be minimized by the implementation of project phasing and appropriate site-specific best management practices (BMPs) for controlling runoff, erosion, and sedimentation. Recommended BMPs to reduce soil erosion and sedimentation include, but are not limited to, silt fences, diversion ditches, riprap channels, water bars, water spreaders, and retention/detention ponds. Furthermore, facility construction plans would be reviewed for compliance with the protocols outlined in the Fort Campbell *Policy for Storm Water Erosion and Sediment Control at Construction Projects* (Fort Campbell, 2006).

Construction at some locations would expect beneficial effects due to reduction of erosion. Sites with existing erosion problems would be repaired. Construction of sediment basins would increase water quality by reducing sediment transport into adjacent waterways.

#### 3.6 WATER RESOURCES

## 3.6.1 Affected Environment

A detailed description of water resources on Fort Campbell is provided in the 2005 RTLP-DP PEA and is incorporated into this SEA by reference. Information on water resource conditions specific to the proposed project sites is provided in the following paragraphs. The surface water systems of Fort Campbell are composed of several streams, totaling 422 stream miles, and four small man-made lakes scattered throughout the installation (Tetra Tech 1999, 2001). Fort Campbell is divided into three subwatersheds, Little West Fork Creek, Saline Creek, and Casey Creek, all of which drain to the Cumberland River. The Cumberland River is approximately 9 miles south of the cantonment area. It flows into the Ohio River, ultimately reaching the Gulf of Mexico through the Mississippi River (Tetra Tech 1999, 2001). The proposed project areas are found within all three subwatersheds.

Little West Fork Creek, Fletcher's Fork, Piney Fork Creek, Noah's Spring Branch, and Casey Creek are listed on the 2004 Clean Water Act Section 303(d) list of impaired water bodies by the States of Tennessee and Kentucky. Parameters of concern are organic enrichment, low dissolved oxygen, aquatic habitat alteration, and siltation. Both states have listed these watersheds as top priorities for Total Maximum Daily Load (TMDL) analysis for sediment. Activities on Fort Campbell have resulted in impacts on surface water quality. Potential sources of surface water quality impacts in the rear areas are storm water runoff from impervious areas, and land disturbances. The amount of sedimentation in streams resulting from erosion ranges from moderate to severe. Steps being implemented to minimize water quality degradation include cessation of grading bare soil firebreaks twice yearly to allow these areas to develop vegetative cover to hold the soil, as well as aggressive enforcement of erosion control requirements on construction projects. Sediment accumulation data have been collected at several locations as part of the Range and Training Land Assessment (RTLA) program. Results show that sedimentation has been affecting biotic communities and compromising aquatic systems at Fort Campbell (BHATE Environmental Associates, Inc., 2004).

#### 3.6.2 Consequences

Short- and long-term minor adverse effects would be expected. In the short term, land clearing and construction activities could increase erosion as well as increase dissolved solid, sediment, and petroleum hydrocarbon content in the water. Development on the proposed project sites could further exacerbate parameters of concern for the three subwatersheds, which are on Tennessee's and Kentucky's 303(d) list of impaired water bodies for siltation, organic enrichment, aquatic habitat alteration, and low dissolved oxygen. These projects would require Fort Campbell to submit a Notice Of Intent (NOI) to obtain coverage under the Kentucky and Tennessee Storm Water General Permit. BMPs to control surface erosion and runoff also would

be required to minimize adverse effects on water quality. Examples of such BMPs that may be included as measures of project phasing include silt fences, straw mats on slopes, erosion control blankets, diversion ditches, riprap channels, water bars, water spreaders, and retention/detention ponds, and eventual reseeding and re-vegetation following construction to minimize waterborne sediment. BMPs for sediment and erosion control are prescribed by both Kentucky and Tennessee and would be followed during and after new construction. In the long term, increased storm water runoff from increased impervious areas associated with new development would be expected to result in minor adverse effects on water resources. Adverse effects would be minimized following the protocols outlined in the Fort Campbell Policy for Storm Water Erosion and Sediment Control at Construction Projects and site-specific Storm Water Pollution Prevention Plans (SWPPPs). Long-term effects to stream sediment loads from increased vehicular crossings at newly constructed fords would be expected. Sediment from off-road tactical driving courses is expected to impact water quality at fords. Adverse impacts would be minimized by constructing cabled-concrete crossings, emplacing bank armor, and limiting use during inclement weather. Each site would be monitored by the LCTA program to track long-term changes in water quality at each ford location.

Consultations with the Tennessee Department of Environment and Conservation would occur to ensure compliance with the CWA and state regulations on water quality. The Combat Driving Course may require a NPDES permit for sediment discharge from the facility operation.

Under the no action alternative, no change from existing conditions would occur. Therefore, no effects on surface water would result.

#### 3.7 BIOLOGICAL RESOURCES

#### 3.7.1 Affected Environment

A detailed description of the flora and fauna, to include threatened, endangered, and species at risk on Fort Campbell is provided in the 2005 RTLP-DP PEA and is incorporated into this SEA by reference. Information on biological resource conditions specific to the proposed project sites is provided in the following paragraphs. The project sites consist of forested and open areas. Forested areas consisting of pine and hardwood species would be cleared for construction of the proposed facilities. Forest products would be disposed in accordance with Army Regulation 200-1, *Environmental Protection and Enhancement* and Title 10, U.S.C. section 2665. All site clearing and future management will conform to INRMP guidelines.

Several state and federally listed threatened or endangered species are known to occur within the four counties encompassing Fort Campbell. The installation supports 80 species listed as threatened or endangered by Kentucky and/or Tennessee, and several species considered special concern, in need of management, rare, or declining by one or both states. Thirteen federally listed species are known to inhabit the four counties encompassing Fort Campbell (Appendix A). Two federally endangered, and three species of management concern, have been recorded on the installation.

The most notable species documented on Fort Campbell are the federally endangered gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*) (Figure 8). Fort Campbell monitors these species and provides yearly reports to the USFWS. Both species are migratory between summer habitat and hibernation caves (hibernacula). No hibernacula have been found on Fort Campbell. As part of the monitoring effort, Fort Campbell staff monitors migratory patterns and evaluates habitat enhancement possibilities to facilitate recovery of these two species. Suitable summer habitat for both species of bat is limited to the installation's wooded stream corridors and scattered wood lots in the more remote areas in the western part of Fort Campbell. No part of Fort Campbell has been designated as critical habitat for these species.

No other federally listed threatened and endangered species are known to occur within the installation boundaries or the project area. Several State-listed species are known to occur on the installation (Fort Campbell, 2004); occurrences near the proposed project areas are shown on Figure 8.

All construction activities will follow ESMC guidance pertaining to timber harvest and reducing water quality impacts.

DoD installations are required to comply with the Migratory Bird Treaty Act (MBTA). The 2003 Defense Authorization Act required the USFWS to reduce restrictions to military readiness training caused by migratory birds. DoD has agreed to work to conserve bird species of conservation concern (BCC species) on installations. The BCC species list was developed by the North American Bird Conservation Initiative (NABCI), with species that occur on Fort Campbell listed for the Central Hardwoods Region, a region that includes 26 species of concern. Fort Campbell has identified 22 of those 26 species occurring on the installation (Table 3), with 13 of the BCC species known to breed on Fort Campbell. BCC species have been documented throughout the rear training areas.

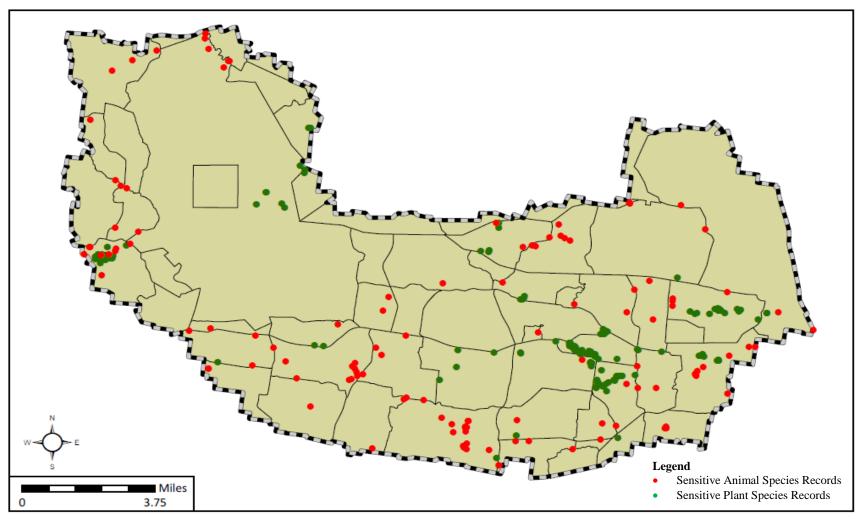


Figure 8. Sensitive species records on Fort Campbell (includes federally listed bat records). RTLP-DP SEA

## 3.7.2 Consequences

Short-term minor adverse effects on vegetation and wildlife would occur as the result of the proposed action. Vegetation would be removed during clearing for construction. No wildlife or plant habitat would be lost outside the boundaries of Fort Campbell. Any incidental losses of wildlife during renovations, construction, or demolition activities would not seriously affect regional wildlife population levels.

Wildlife species in the project area, including migratory birds, would be displaced. This impact would be temporary, because wildlife would acclimate to other suitable habitat areas on Fort Campbell and in the surrounding region. Implementation of controls (NPDES, SWPPP), compliance with the installation's Endangered Species Management Component, and use of BMPs would ensure that endangered bat foraging areas within the rear training areas would not be adversely impacted. Implementation of the proposed action would result in a loss of habitat for BCC species; however, loss of less than one percent of the available habitat on Fort Campbell would be a less than significant impact on BCC species. BCC species are migratory and do not occur on Fort Campbell year round. Because birds are very mobile, the disturbance associated with tree clearing and construction would cause the birds to avoid construction areas, thus making direct mortality very unlikely. If tree clearing to prepare construction sites can be completed during the winter, reproduction would not be affected and clutch abandonment would be unlikely to result from project implementation. Should tree clearing extend into the summer, pairs with established nests in the tree clearing and construction areas would have their nests destroyed and may not be able to re-nest in another area. Those with nests adjacent to tree clearing and construction areas would possibly abandon their nests. Regardless of this, the impact to BCC species would be less than significant.

Under the no action alternative, the proposed action would not be implemented. Therefore, there would be no effects on biological resources.

Table 3. Bird Species of Conservation Concern Occurring on Fort Campbell RTLP-DP SEA, Fort Campbell, Kentucky

Species Name	Common Name	Known to Breed on Fort Campbell
Aimophila aestivalis	Bachman's sparrow	Yes
Ammodramus henslowii	Henslow's sparrow	Yes
Ammodramus leconteii	Le Conte's sparrow	No
Asian flammeus	short-eared owl	No
Calcarius pictus	Smith's longspur	No
Caprimulugus voiciferus	Eastern whip-poor-will	Yes
Cistothorus platensis	sedge wren	Yes
Dendroica cerulea	Cerulean warbler	No
Dendroica discolor	prairie warbler	Yes
Euphagus carolinus	rusty blackbird	No
Falco peregrines	peregrine falcon	No
Haliaeetus leucocephalus	bald eagle	No
Helmitheros vermivorus	worm-eating warbler	Yes
Hylocichla mustelina	wood thrush	Yes
Lanius ludovicianus	loggerhead shrike	No
Melenerpes erythrocephalus	red-headed woodpecker	Yes
Oporornis formosus	Kentucky warbler	Yes
Thyromanes bewickii	Bewick's wren	No
Tringa solitaria	solitary sandpiper	No
Tryngites subruficollis	buff-breasted sandpiper	No
Vermivora pinus	blue-winged warbler	Yes
Vireo bellii	Bell's vireo	Yes

Data provided by Daniel Moss, Fort Campbell Avian Ecologist

# 3.8 CULTURAL RESOURCES

Section: APPENDIX E

## 3.8.1 Affected Environment

A detailed description of cultural resources at Fort Campbell is provided in the 2005 RTLP-DP PEA and is incorporated into this SEA by reference. Cultural Resources Management procedures for Fort Campbell are defined in Army Regulation 200-1, *Environmental Protection and Enhancement*, Headquarters, Department of the Army. Cultural resources include historic properties (buildings, structures, districts, etc. as defined by AR 200-1 and the National Historic Preservation Act [NHPA]), archaeological sites (as defined and governed by the Archaeological Resources Protection Act [ARPA], AR 200-1 and the NHPA), Native American sacred sites (as identified in Executive Order 13007 and the American Indians Religious Freedom Act [AIRFA]), Traditional Cultural Properties (as defined in the NHPA and as described in National Register Bulletin 38), and sites and artifacts associated with Native American graves (as defined and governed by the Native American Graves Protection and Repatriation Act [NAGPRA]).

Fort Campbell adopted an *Integrated Cultural Resource Management Plan* (ICRMP) in 2002 that contains the inventory of cultural resources at Fort Campbell and procedures for their management. Fort Campbell has also entered into a Programmatic Agreement (PA) between the Kentucky State Historic Preservation Office (SHPO), the Tennessee Historical Commission (SHPO), the Advisory Council on Historic Preservation (ACHP), and Fort Campbell that outlines the process alternative for compliance with 36 CFR 800 in considering the effects of operations, maintenance and development on historic properties. A total of 1670 archaeological sites have been identified within the installation's boundaries. To date, 751 of these sites have formal determinations of eligibility with concurrence from appropriate SHPO. Of this total, thirteen (13) sites have been determined eligible for the NRHP. As a requirement of the PA, sites lacking formal eligibility determinations require Section 106 Consultations with appropriate State Historic Preservation Offices prior to the initiation of proposed undertakings.

#### 3.8.2 Consequences

During implementation of activities associated with the proposed action, there is the potential that previously unknown archaeological resources could be discovered. If such resources are discovered, activities at the location of the discovery would cease until the Fort Campbell Directorate of Public Works Cultural Resources Program has assessed the discovery and determined the appropriate course of action, in compliance with the installation's ICRMP and Section 106 of the NHPA. The Fort Campbell ICRMP has standard operating procedures that address the unexpected discovery of archaeological resources. Any intact archaeological resources discovered would be recorded and evaluated for eligibility to the NRHP, in consultation with the Kentucky and Tennessee State Historic Preservation Office (SHPO). Treatment of the discovery would be determined by the installation, again in consultation with both state SHPOs. Potential impacts to cultural sites either adjacent to or contained within a project's footprint will be addressed in subsequent NEPA documentations following the Fort Campbell NEPA procedure utilizing a Record of Environmental Consideration (REC) for each project defined within this analysis.

The following review of proposed actions described in this SEA was provided by Fort Campbell Cultural Resource Management.

#### Training Area 48-Renovations and MOUT Facility Development

Training Area 48 has been inventoried for archaeological resources. Four sites are located within the project areas of the proposed action. All sites were recommended as *not eligible* for listing on the National Register of Historic Places (NRHP) by consultants. There has not been a formal determination on eligibility with concurrence from the Tennessee State Historic Preservation Office (TN SHPO). These sites cannot be disturbed without additional Section 106 compliance documentation and concurrence from the TN SHPO. Some of these sites were recently investigated to determine site boundaries and conclusively determine if it is eligible for listing in the NRHP. FTC-CRMP is currently waiting for draft report submission from consultants. Upon receipt of the draft report and REC for the proposed undertaking, the CRMP will initiate the Section 106 Consultation process with the TN SHPO. Project proponent can expect a concurrence of *No Adverse Effect* within 90 days after Record of Environmental Consideration (REC) submittal. Sites not included in this survey may require additional fieldwork. A more detailed assessment of required work will be made after submission of a REC document.

#### Training Area 21-UAS Asphalt Runway and Operations Building

Training Area 21 has been inventoried for archaeological resources. Five sites are located within the project areas of the proposed action. The sites located to the west of Palmyra Road were determined *not eligible* for listing on the NRHP, with concurrence from the TN SHPO. The three sites located to the east of Palmyra Road were recommended as *not eligible* for listing on the NRHP by consultants. There has not been a formal determination of eligibility with concurrence from the SHPO. These three sites cannot be disturbed without additional Section 106 compliance documentation and concurrence from the TN SHPO. Upon receipt of REC for the proposed undertaking, the Fort Campbell Cultural Resource Management Program (FTC-CRMP) will initiate the Section 106 Consultation process with the TN SHPO. Project proponent can expect a concurrence of *No Adverse Effect* within 90 days after REC submittal.

#### Training Area 44A-Fixed-wing Runway in Veghel Drop Zone

Training Area 44A has been inventoried for archaeological resources. Two sites are located within the project areas of the proposed action. The sites were recommended as *not eligible* for the NRHP by consultants with concurrence from Kentucky State Historic Preservation Office (KY SHPO). There are no cultural resource concerns at this time; however, FTC-CRMP must review REC document for complete evaluation of any cultural resource impacts.

# Training Area 47-Mobility Course for 5th Special Forces Group

Training Area 47 has been inventoried for archaeological resources. Eleven sites are located within the project areas of the proposed action. Nine sites were determined as *not eligible* for listing on the NRHP, with concurrence from the TN SHPO. There are no further concerns with these nine sites. Two sites were determined as *potentially eligible* for listing on the NRHP by consultants with concurrence from the TN SHPO. These two sites cannot be disturbed without additional Section 106 Compliance documentation. FTC-CRMP staff cannot fully assess the need for a Section 106 consultation without a more adequate boundary of ground disturbance

areas. If the two *potentially eligible* sites are within the area of ground disturbance, a Phase II archaeological survey will be required.

#### Development of Range 44 Live Fire Shoot House (LFSH)

The project site is located on the southeastern portion of the North Impact Area on the installation. This area is exempt from further archaeological survey per the OPS PA. There are no further cultural concerns.

Under the no action alternative, the proposed action would not be implemented. There would be no effects on cultural resources

#### 3.9 CUMULATIVE EFFECTS

The most severe environmental impacts may not result from the direct effects of any particular action, but from the combination of effects of multiple, independent actions over time. The CEQ regulations implementing NEPA define a cumulative impact for purposes of NEPA as follows:

Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR Section 1508.7).

CEQ guidelines state that cumulative effects analyses should be limited to the effects that can be evaluated meaningfully by the decision makers. The guidelines further state that the area to use in defining the cumulative impacts geographical boundary should extend to the point at which the resource is no longer affected significantly (CEQ, 1997).

Significant cumulative impacts would occur if incremental impacts of the proposed action (or the alternatives), added to the environmental impacts of past, present and reasonably foreseeable actions (identified below), result in an adverse significant effect to regional resources. For an impact to be considered cumulative, these incremental impacts and potential incremental impacts must be related in space and time, so that they are either capable of combining (when considering potential incremental impacts of future projects) or have, in fact, combined (when considering impacts of current and past projects).

Fort Campbell is currently responding to multiple mission changes and planning programs. In addition to conducting the routine military construction program, Fort Campbell is also responding to the larger Army reorganization efforts of Modularity, GTF, and IGPBS. It is difficult to fully evaluate the long term cumulative impacts until final reorganization and planning decisions are made. Once finalized, these reorganization efforts will translate into a variety of projects over time. Any additional projects would be assessed in future NEPA documentation.

#### 4.0 FINDINGS AND CONCLUSIONS

This SEA has been prepared to evaluate the potential effects on the natural and human environment from activities associated with implementation of the proposed action. Only VECs with potential impacts greater than defined in the 2005 RTLP-DP PEA were analyzed in this SEA.

#### 4.1 FINDINGS

The evaluation of the proposed action indicates that implementation of projects amended to the RTLP-DP would not significantly affect the environment. Table 4 provides a summary and comparison of the consequences of the proposed action versus the no action alternative.

#### 4.2 CONCLUSIONS

Based on the analysis performed in this SEA, implementation of the proposed action would have no significant direct, indirect, or cumulative effects on the quality of the natural and human environment. Issuance of a Finding of No Significant Impact (FNSI) is appropriate.

Table 4. Summary of Potential Environmental and Socioeconomic Consequences RTLP-DP SEA, Fort Campbell, Kentucky

Resource	No Action	Implementation of Proposed Action
Land Use	No effect	Less than significant; land use designation change from maneuver land to permanent fixed facilities would not change the training designation.
Air Quality	No effect	Less than significant; construction related fugitive dust that will be controlled through appropriate mitigation measures.
Noise	No effect	Less than significant, appropriate worker safety measures will be implemented; minor temporary increase in noise from UAS operations.
Geology and Soils	No effect	Less than significant; appropriate mitigation measures would be implemented to minimize erosion and impact from stromwater runoff.
Water Resources		
Surface Water	No effect	Less than significant; use of appropriate BMPs and stormwater controls would prevent impacts to surface waters from construction activities and operation of the proposed facilities.
Floodplains/Wetlands	No effect	Less than significant; use of appropriate BMPs would prevent impacts to floodplains and wetlands from construction activities and operation of the proposed facilities.

Resource	No Action	Implementation of Proposed Action
Storm water	No effect	Less than significant; use of appropriate BMPs and stormwater controls would prevent impacts from construction activities and subsequent motor pool operations.
Biological Resources		
Vegetation	No effect	Less than significant; the proposed action would not alter the general vegetation cover for the installation.
Wildlife	No effect	Less than significant; wildlife would be displaced to other areas of the installation or surrounding areas.
Migratory BCC	No effect	Less than significant; permanent displacement from the project area and potential loss of one breeding season. Suitable additional habitat exists in the region and breeding season loss would not cause local extirpation.
Sensitive Species	No effect	Less than significant; no direct impacts and negligible indirect impacts from loss of potential foraging areas. Mitigation measures included in reduction of storm water runoff quantity and quality would address the potentially indirect effects on endangered bats.

Resource	No Action	Implementation of Proposed Action
Cultural Resources	No effect	Potential impacts to cultural sites either adjacent to or contained within a project's footprint will be addressed in subsequent NEPA documentations following the Fort Campbell NEPA procedure utilizing a Record of Environmental Consideration (REC) for each project defined within this analysis.
Historic Resources	No effect	Potential impacts to historical sites either adjacent to or contained within a project's footprint will be addressed in subsequent NEPA documentations following the Fort Campbell NEPA procedure utilizing a Record of Environmental Consideration (REC) for each project defined within this analysis.
Archaeological Resources	No effect	Potential impacts to cultural sites either adjacent to or contained within a project's footprint will be addressed in subsequent NEPA documentations following the Fort Campbell NEPA procedure utilizing a Record of Environmental Consideration (REC) for each project defined within this analysis.
Indirect and Cumulative Impacts	No effect	Cumulative effects to sites either adjacent to or contained within a project's footprint will be addressed in subsequent NEPA documentations following the Fort Campbell NEPA procedure utilizing a Record of Environmental Consideration (REC) for each project defined within this analysis.

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### 8.0 ACRONYMS

AAR After Action Review

ACHP Advisory Council on Historic Preservation

AHPA Archeological and Historic Preservation Act

AIRFA American Indian Religious Freedom Act

APE Areas of Potential Effect

AR Army Regulation

ARPA Archeological Resources Protection Act

BMP Best Management Practices

CAA Clean Air Act

CAFEX Combined Arms Live Fire Exercises

CEQ President's Council on Environmental Quality

CFR Code of Federal Regulations

CRM Cultural Resource Manager

DA Department of the Army

DMPRC Digital Multi-Purpose Range Complex

EIS Environmental Impact Statement

EO Executive Order

ESA Endangered Species Act

ESMC Endangered Species Management Component

FOB Forward Operating Base

FNSI Finding No Significant Impact

GTF Grow The Force

GWOT Global War on Terrorism

HMMWV Highly Mobile Military Wheeled Vehicle

ICRMP Integrated Cultural Resource Management Plan

IED Improvised Explosive Device

IENMP Installation Environmental Noise Management Plan

INRMP Integrated Natural Resource Management Plan

ITAM Integrated Training Area Management

KDFWR Kentucky Division of Fish and Wildlife Resources

LZ Landing Zone

MATCH Modular Armored Tactical Combat House

MBTA Migratory Bird Treaty Act

MOUT Military Operations on Urbanized Terrain

MOA Memorandum of Agreement

NAGPRA Native American Graves Protection and Repatriation Act

NEPA National Environmental Policy Act

NHPA National Historic Preservation Act

NOI Notice of Intent

OPFOR Opposing Force

PEA Programmatic Environmental Assessment

PMCS Preventive Maintenance, Checks and Services

POL Petroleum, Oils and Lubricants

REC Record of Environmental Consideration

RPM Reasonable and Prudent Measures

RTLA Range and Training Land Assessment

RTLP-DP Ranges and Training Land Program Development Plan

SEA Supplemental Environmental Assessment

SHPO State Historic Preservation Officer

SOP Standard Operating Procedures

TA Training Area

TES Threatened and Endangered Species

UAS Un-manned Aircraft System

USACE United State Corps of Engineers

USFWS U.S. Fish and Wildlife Service

VEC Valued Environmental Component

# Appendix A

Federally and State Listed Species Known to Occur in Montgomery County, Tennessee Stewart County, Tennessee Trigg County, Kentucky Christian County, Kentucky

# Table A-1 Federally-listed Species in the Four Counties within the Installation RTLP-DP SEA, Fort Campbell, Kentucky

Common Name	Scientific Name	Federal Status
American burying beetle	Nicorphorus americanus	Endangered
Coleman cave beetle	Pseudanophthalmus colemanensis	Candidate
Fanshell	Cyprogenia stegaria	Endangered
Fluted kidney shell	Ptychobranchus subtentum	Endangered
Gray bat	Myotis grisescens	Endangered
Indiana bat	Myotis sodalis	Endangered
Littlewing pearly mussel	Pegias fabula	Endangered
Pink mucket	Lampsilis abrupta	Endangered
Price's potato bean	Apios priceana	Threatened
Red-cockaded woodpecker	Picoides borealis	Endangered
Ring pink	Obovaria retusa	Endangered
Short's bladderpod	Lesquerella globosa	Candidate
Winged mapleleaf	Quadrula fragosa	Endangered

#### Source:

Section: APPENDIX E

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# Table A-2 State-listed Species in the Four Counties within the Installation RTLP-DP SEA, Fort Campbell, Kentucky

Section: APPENDIX E

C N	Scientific Name		Status	
Common Name			TN	
Earleaved false-foxglove	Agalinis auriculata	Е	Е	
Limestone blue star	Amsonia tabernaemontana var. gattingeri		S	
Price's potato bean	Apios priceana		Е	
Short's rock cress	Arabis shortii		S	
Lakecress	Armoracia lacustris	Т		
Purple milkweed	Asclepias purpurascens		S	
Spreading false-foxglove	Aureolaria patula		S	
Blue wild-indigo	Baptisia australis var. minor	S		
Cream wild-indigo	Baptisia bracteata var. glabrescens	S		
Broadwing sedge	Carex alata	Т		
Bristly sedge	Carex comosa		Т	
Heavy sedge	Carex gravida		S	
Lake-bank sedge	Carex lacustris		Т	
Muskingum sedge	Carex muskingumensis		Е	
Hairy sharp-scaled sedge	Carex oxylepis var. pubescens		S	
Stalkgrain sedge	Carex stipata var. maxima	Н		
Appalachian bugbane	Cimicifuga rubifolia		Т	
Silky dogwood	Cornus obliqua		S	
Pitcher leather-flower	Clematis pitcheri		Т	
Carolina larkspur	Delphinium carolinianum	Т		
Creamflower tick-trefoil	Desmodium ochroleucum		Е	
Beak grass	Diarrhena obovata		S	
Wedge-leaf whitlow-grass	Draba cuneifolia	Е		
Pale purple coneflower	Echinacea pallida		Т	
Dwarf burhead	Echinodorus tenellus var. parvulus	Ε		
Matted spike-rush	Eleocharis intermedia		Е	
Lance-like spike-rush	Eleocharis lanceolata		S	
Nuttall's waterweed	Elodea nuttallii		S	
Sweet-scented Indian plantain	Hasteola suaveolens		Т	
Common silverbell	Halesia carolina	Е		
Naked-stem sunflower	Helianthus occidentalis		S	
Cow-parsnip	Heracleum lanatum	Н		
Grassleaf mud-plantain	Heteranthera dubia	S		
Blue mud-plantain	Heteranthera limosa	S	Т	

Hairy hawkweed	Hieracium longipilum	Т	S
Featherfoil	Hottonia inflata		S
Golden seal	Hydrastis canadensis		S
Lamance iris	Iris brevicaulis		Е
White walnut or butternut	Jugulans cinerea		Т
Fen orchis	Liparis loeselii		Т
Fraser's loosestrife	Lysimachia fraseri		Е
Round-head bush-clover	Lespedeza capitata	S	
Tall bush-clover	Lespedeza stuevei	Т	
Short's bladderpod	Lesquerella globosa		Е
Lescur's bladderpod	Lesquerella lescurii	Н	
Michigan lily	Lilium michiganese		Т
Hispid falsemallow	Malvastrum hispidum	Т	
Carolina angelpod	Matelea carolinensis	Е	
Hair grass	Muhlenbergia glabrifloris	S	S
Thread-like naiad	Najas gracillima	S	
Lake cress	Neobeckia aquatica		S
Thread-leaf sundrop	Oenothera linifolia	Е	
Clustered bluets	Oldenlandia uniflora	Е	
Hairy false gromwell	Onosmodium hispidissimum	Е	
Prairie ragwort	Packera plattensis		S
Ginseng	Panax quinquefolius		S
Swamp lousewort	Pedicularis lanceolata		S
Ozark downy flox	Phlox pilosa spp. Ozarkana		S
Blue scorpion-weed	Phacelia ranunculacea	S	S
Maryland milkwort	Polygala mariana		S
Rough rattlesnake-root	Prenathes aspera	Е	
Bearded rattlesnake-root	Prenathes barbata	Е	S
Nodding rattlesnake-root	Prenathes crepidinea		Е
Mock bishop's-weed	Ptilimnium capillaceum	Т	
Nuttall's mock bishop's-weed	Ptilimnium nutallii	Е	
Winged mapleleaf	Quadrula fragosa	Х	
White water buttercup	Ranunculus aquatilis var. diffusus		Е
Yellow water-crowfoot	Ranunculus flabellaris		Т

Rhynchosia tomentosa

Rudbeckia subtomentosa

Sagittaria brevirostra

Sagittaria graminea

Ribes odoratum

Section: APPENDIX E

Hairy snoutbean

Buffalo Currant

Sweet coneflower

Short-beaked arrowhead

Grassleaf arrowhead

Ε

Ε

Т

Т

Т

Т

Ovate-leaved arrowhead	Sagittaria platyphylla		S
Sessile fruited arrowhead	Sagittaria rigida		S
Hall's bulrush	Schoenoplectus hallii	Е	
Fringed nutrush	Scleria ciliata	Е	
Royal catchfly	Silene regia	Е	
Compass plant	Silphium laciniatum	Т	Т
Southern prairie dock	Silphium pinnatifidum		Е
Rock goldenrod	Solidago rupestris		Е
Trepocarpus	Trepocarpus aethusae	S	
Buffalo Clover	Trifolium reflexum		Е
Least trillium	Trillium pusillum	Е	
Sand grape	Vitis rupestris		Е
Southern wild rice	Zizaniopsis miliacea	Т	
Clebsch's pocket moss	Fissidens clebschii		S
Elktoe	Alasmidonta marginata	Т	
Swamp metalmark	Calephelis muticum	Е	
Hairy crayfish	Cambarus friaufi	S	
Fanshell	Cyprogenia stegaria	Е	
Pink mucket	Lampsilis abrupta		Е
Pocketbook	Lampsilis ovata	Е	
Armored rocksnail	Lithasia armigera	S	
Muddy rocksnail	Lithasia salebrosa	S	
Varicose rocksnail	Lithasia verrucosa	S	
American burying beetle	Nicorphorus americanus	Е	
Ring pink	Obovaria retusa	Е	
Mammoth Cave crayfish	Orconectes pellucidus	S	
Rattlesnake-master borer moth	Papaipema eryngii	Е	
Littlewing pearly mussel	Pegias fabula	Е	
Orange-footed pearly mussel	Plethobasus cooperianus	Е	
Sheepnose	Plethobasus cyphyus	Е	
Pyramid pigtoe	Pleurobema rubrum	Е	
Coleman cave beetle	Psuedanophthalmus colemanensis		С
Fluted kidneyshell	Ptychobranchus subtentum	С	
Winged mapleleaf	Quadrula fragosa	Е	
Northern oak hairstreak	Satyrium favonius ontario	S	
An amphipod	Stygobromus vitreus	S	
Little Spectaclecase	Villosa lienosa	S	
Mountain creekshell	Villosa vanuxemensis vanuxemensis	Т	
	Γ		

Acipenser fulvescens

Section: APPENDIX E

Lake sturgeon

Ε

Blue sucker	Cycleptus elongatus		Т
Smallscale darter	Etheostoma microlepidum	E	
Cypress darter	Etheostoma proeliare	Т	
Shawnee darter	Etheostoma tecumsehi	S	
Chestnut lamprey	Ichthyomyzon castaneus	S	
Black buffalo	Ictiobus niger	S	
Redspotted sunfish	Lepomis miniatus	Т	
Inland silverside	Menidia beryllina	Т	
Slender madtom	Noturus exilis	Е	
Slenderhead darter	Percina phoxocephala		D
Southern cavefish	Typhlichthys subterraneus	S	
Eastern Hellbender	Cryptobranchus alleganiensis alleganiensis	Ε	
Bird-voiced treefrog	Hyla avivoca	S	
Barking treefrog	Hyla gratiosa	S	D
Midland smooth softshell	Apalone mutica mutica	S	
Southeastern five-lined skink	Eumeces inexpectatus	S	
Scarlet kingsnake	Lampropeltis triangulum elapsoides	S	
Alligator snapping turtle	Macrochelys temminkii		D
Copperbelly watersnake	Nerodia erythrogaster neglecta	S	
Northern pine snake	Pituophis melanoleucus melanoleucus	Е	
Western pigmy rattlesnake	Sistrurus miliarius streckeri	Т	
Eastern slender glass lizard	Ophisaurus attenuatus longicaudus		D
Eastern ribbon snake	Thamnophis sauritus sauritus	S	
Sharp-shinned hawk	Accipiter striatus	S	
Bachman's sparrow	Aimophila aestivalis	Е	Е
Henslow's sparrow	Ammodramus henslowii	S	D
Northern shoveler	Anas clypeata	Е	
Blue-winged teal	Anas discors	Т	
Golden eagle	Aquila chrysaetos		Т
Great egret	Ardea alba	Т	
American bittern	Botaurus lentiginosus	Н	
Cattle egret	Bubulcus ibis	S	
Lark sparrow	Chondestes grammacus	Т	Т
Cerulean warbler	Dendroica cerulea		D
Little blue heron	Egretta caerulea	Ε	
Bald eagle	Haliaeetus leucocephalus	Т	D
Loggerhead shrike	Lanius ludovicianus		D
Swainson's warbler	Limnothlypis swainsonii		D
Yellow-crowned night-heron	Nyctanassa violacea	Т	

Black-crowned night-heron	Nycticorax nycticorax	Т	
Osprey	Pandion haliaetus	S	
Savannah sparrow	Passerculus sandwichensis		D
Pied-billed grebe	Podilymbus podiceps	Е	
Vesper's sparrow	Pooecetes gramineus		D
Yellow-bellied sapsucker	Sphyrapicus varius appalaci		D
Bewick's wren	Thyromanes bewickii	S	Е
Barn owl	Tyto alba	S	
Bell's vireo	Vireo bellii	S	
Southeastern myotis	Myotis austroriparius	Е	
Indiana bat	Myotis sodalis	Е	Е
Gray bat	Myotis grisescens	Е	Е
Evening bat	Nycticeius humeralis	S	
Southeastern shrew	Sorex longirostris		D
Cinereus shrew	Sorex cinereus		D
Southern bog lemming	Synaptomys cooperi		D
Meadow jumping mouse	Zapus hudsonius		D

#### Notes:

- T: Threatened
- E: Endangered
- D: Deemed in Need of Management
- S: Species of Special Concern

Section: APPENDIX E

- H: Historic
- C: Candidate

#### Sources:

Tennessee Department of Environment and Conservation Division of Natural Areas. July 2009. Rare Species List by County-Montgomery County. <a href="http://www.state.tn.us/environment/na/species">http://www.state.tn.us/environment/na/species</a>. Accessed January 9, 2012.

Tennessee Department of Environment and Conservation Division of Natural Areas. July 2009. Rare Species List by County-Stewart County. <a href="http://www.state.tn.us/environment/na/species">http://www.state.tn.us/environment/na/species</a>. Accessed January 9, 2012.

Kentucky State Nature Preserves Commission. County Report of Endangered, Threatened, and Special Concern Plants, Animals, and Natural Communities of Kentucky-Trigg County. <a href="www.naturepreserves@ky.gov">www.naturepreserves@ky.gov</a>. Accessed January 9, 2012.

Kentucky State Nature Preserves Commission. County Report of Endangered, Threatened, and Special Concern Plants, Animals, and Natural Communities of Kentucky-Christian County. <a href="www.naturepreserves@ky.gov">www.naturepreserves@ky.gov</a>. Accessed January 9, 2012.

	Page 466 of 947
** REFER TO APPENDIX DD FOR SIGNAGE	**

W912QR-23413770 CERTIFIED FINAL-003

W912QR-23413770 CERTIFIED FINAL-003 Page 467 of 947

APPENDIX G GIS Data

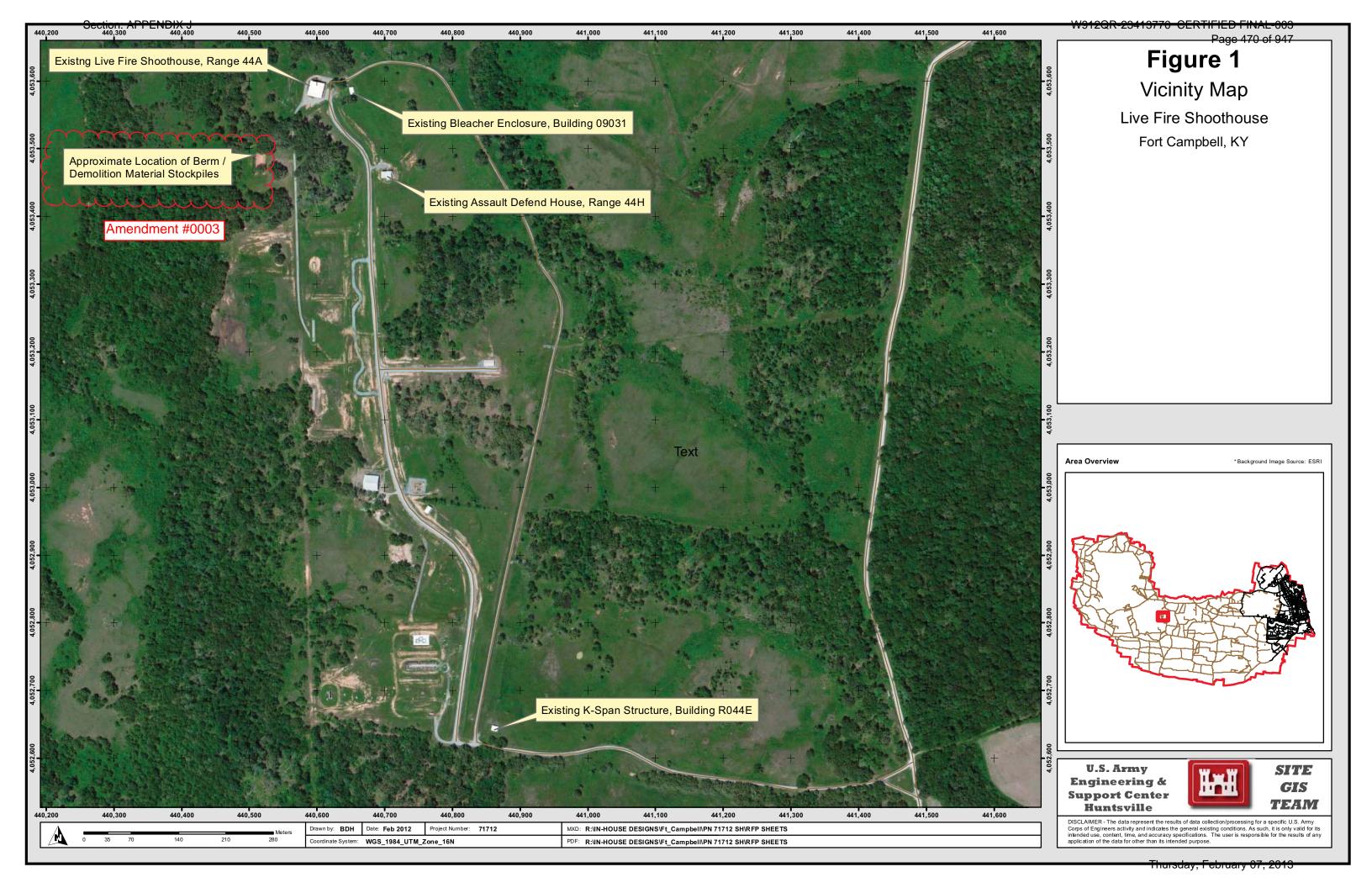
Section: APPENDIX G

Not Used

# APPENDIX I Acceptable Plants List

Section: APPENDIX I

Not Used





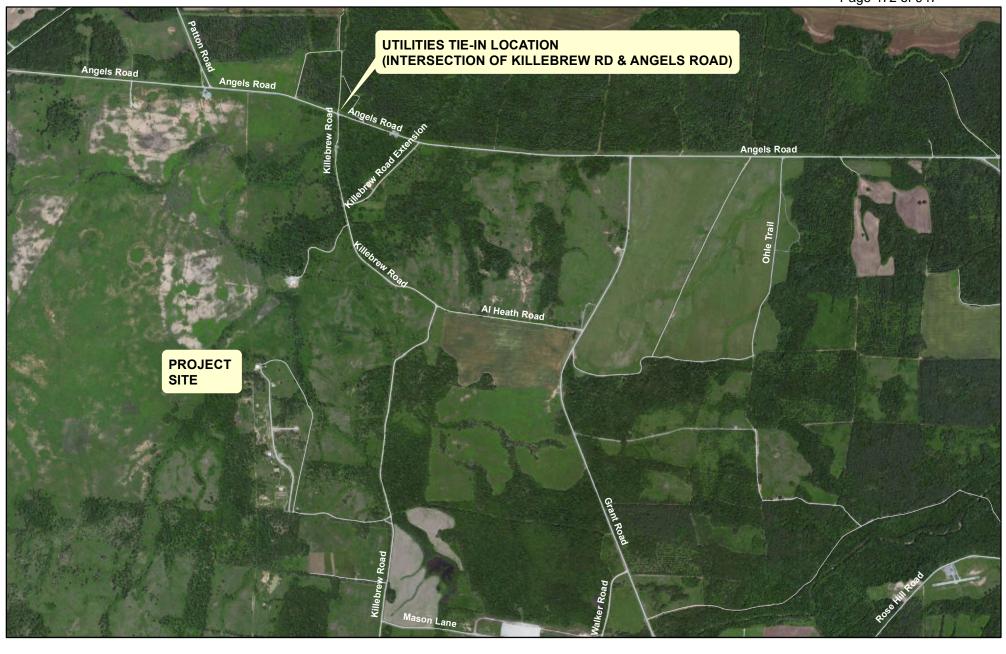






# **UTLITIES TIE-IN LOCATION**

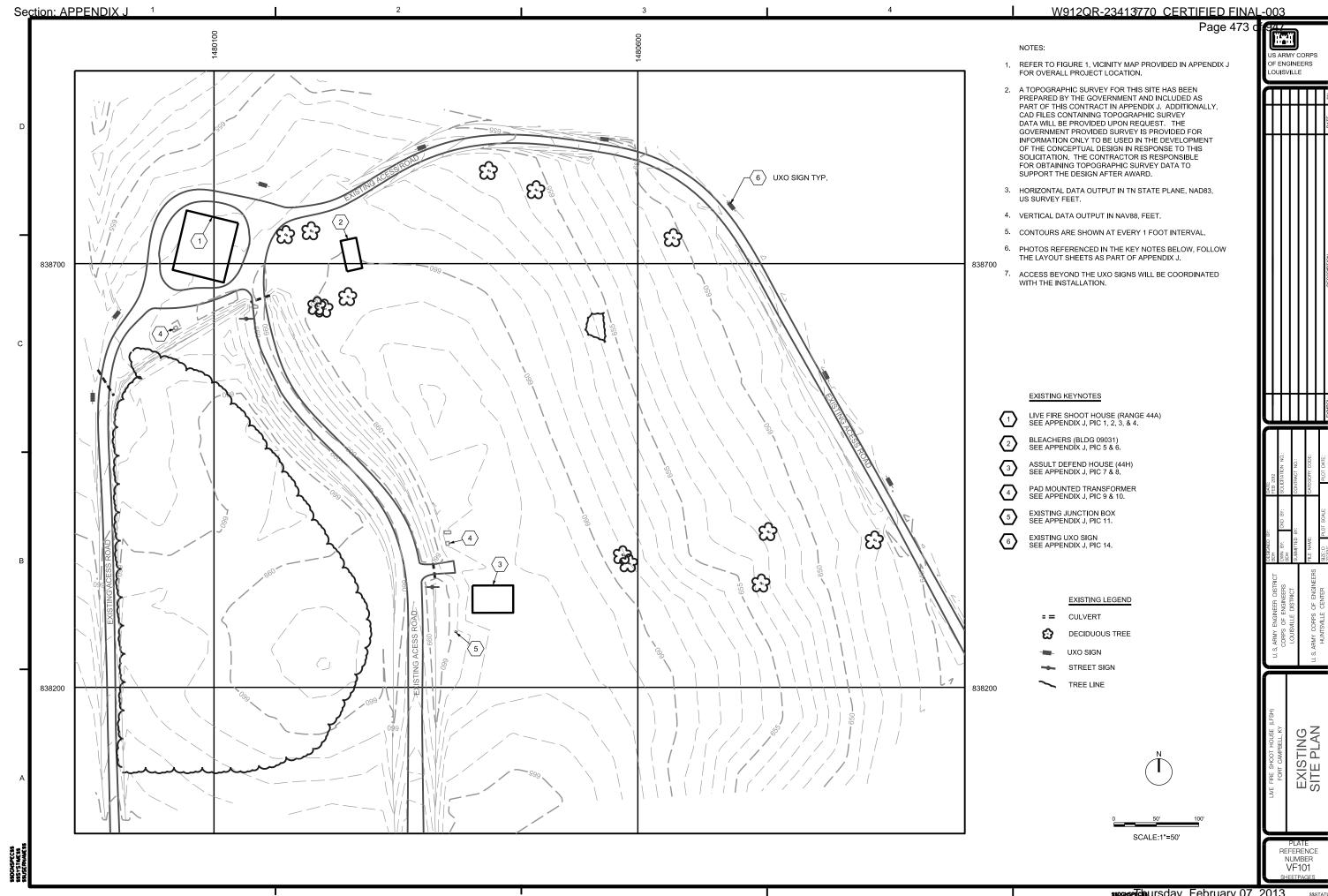
W912QR-23413770 CERTIFIED FINAL-003 Page 472 of 947

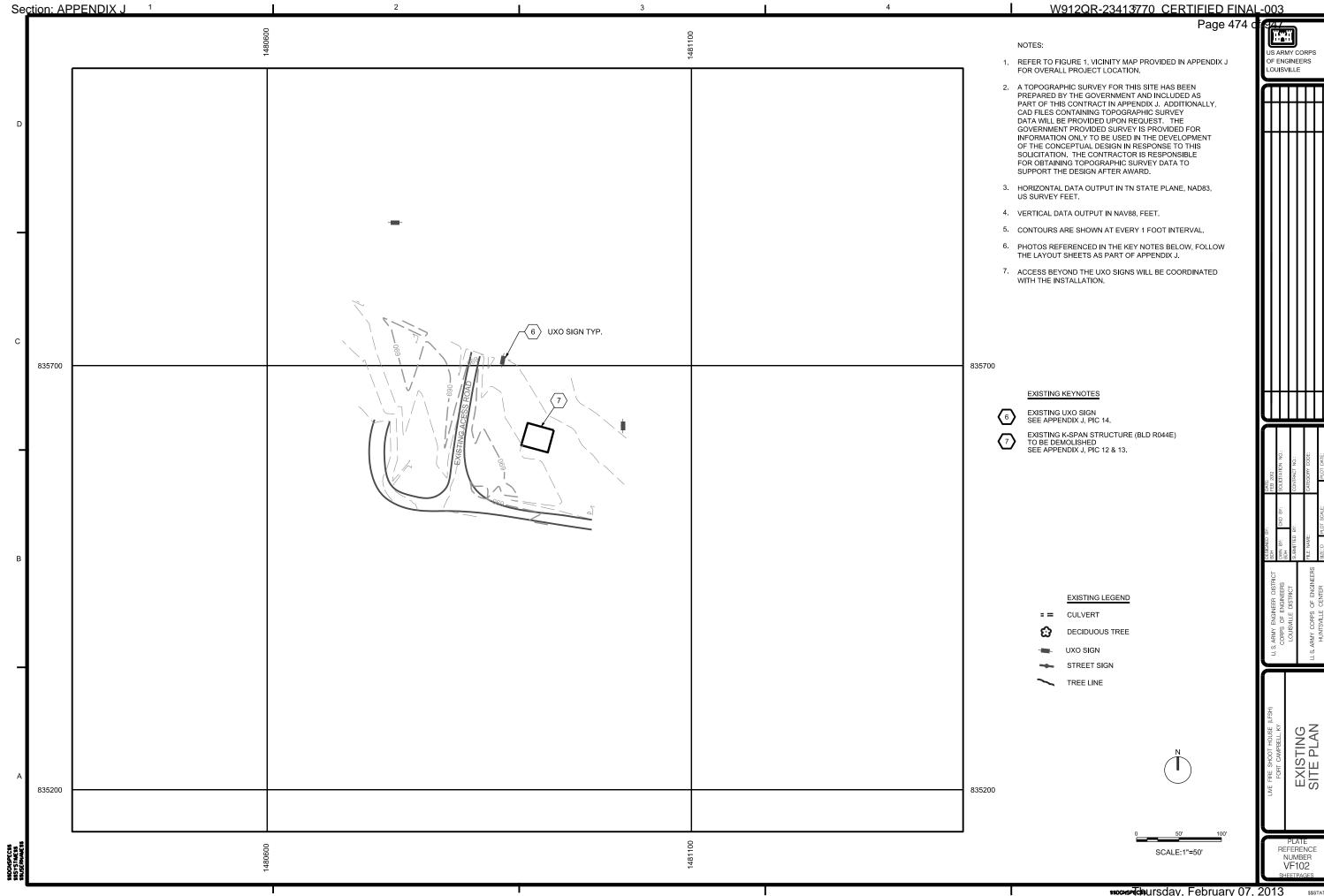






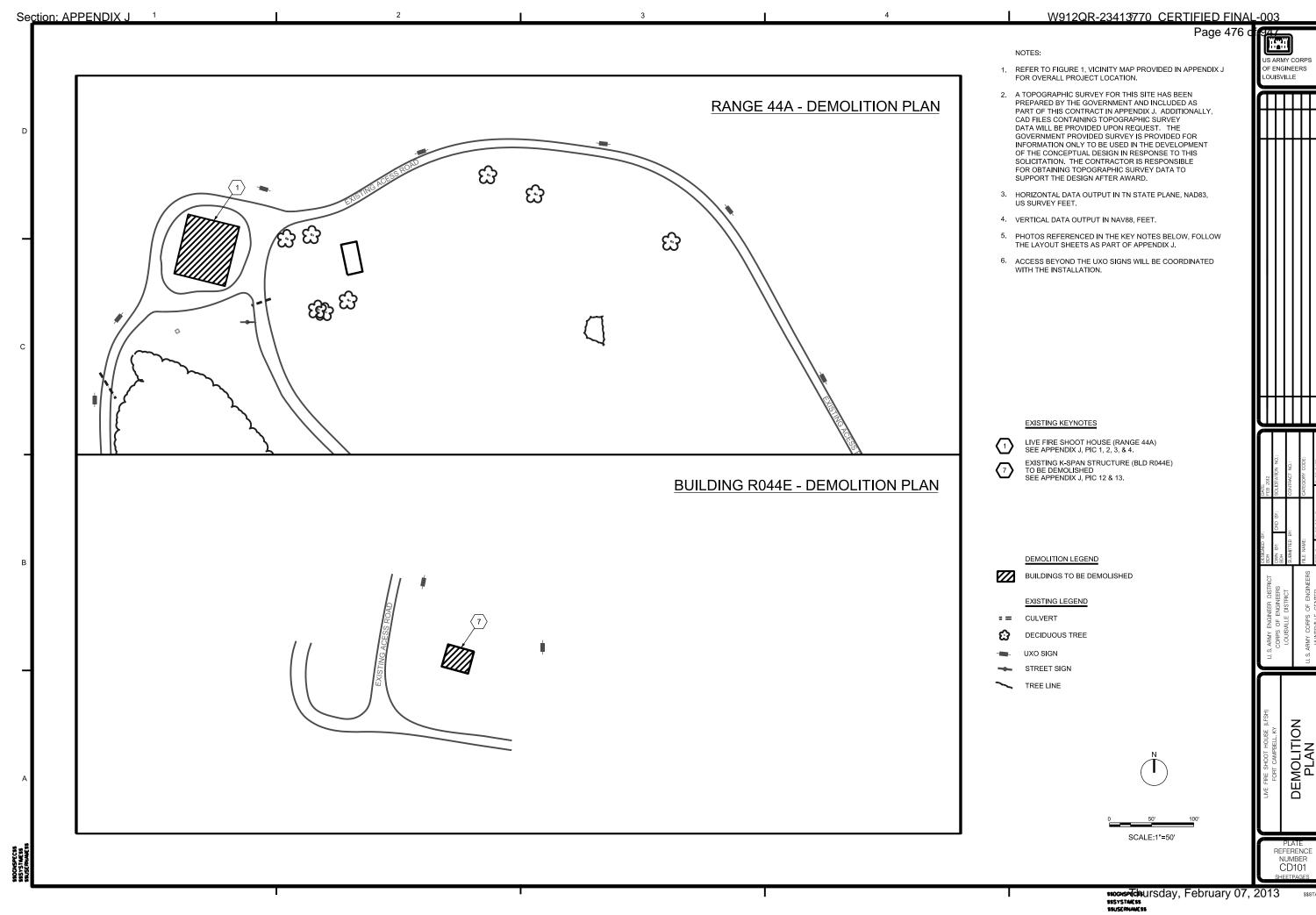






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Thursday, February 07, 2013







Picture 1, 2, 3, & 4 – Range 44A, Existing Live Fire Shoothouse.



Picture 5 & 6 – Existing Bleacher Enclosure, Building 09031.





Picture 7 & 8 – Range 44H, Existing Assault Defend House.



Picture 9 & 10 – Existing Transformers.



Picture 11 – Existing Junction Box.

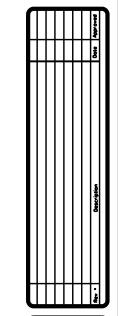




Picture 12 & 13 – Existing K-Span Structure, Building R044E.



Picture 14 – Unexploded Ordinance Warning Signs.





SUPPORT CENTER, HUNTSVELE HUNTSVELE, ALABANA 15 MAY 2007

GE AND TRAINING LAND PROSTANDARD DESIGN MANUAL SHOOT HOUSE

NOTES

1. The standard shoothouse includes a minimum net training space of approximately 158 square meters (1700sf). The actual size of the facility depends on the thickness of the bullet absorbing material chosen. The standard depicts 610mm (24") thick walls.

The gross area of the shoothouse should be kept to a maximum of 232 square meters (2500sf).

The shoothouse cover should be kept to a maximum of 418 square meters (4500sf).

2. Bullet absorbing wall may be SACON, sand filled wall section or other commercial product designed to stop and contain rounds and ricochets.

Seperate bullet traps should be used behind targets to reduce the number of rounds impacting the walls.

 Bullet absorbing wall system must be designed to be replaceable or repairable.

5. The shoot house is not designed for live fragmentation/concussion grenades.

6. The shoot house must be designed to accommodate the types of mechanical and explosive breaching techniques that will be used.

7. The SDZ of the facility is based on the locations of the firing points and targets, the weapon systems used and the ricochet characteristics of the bullet absorbing walls, a deviation is normally required.

8. The shoothouse must provide a means of stopping and containing rounds exiting through the exterior doors and blow holes in the shoothouse. This may be done using additional bullet absorbing wall material, earth berms, or other method.

The layout of the rooms may be changed from the standard in order to support a units porticular training tasks.

10. The electrical room and catwalk should be designed so they are not supported by the shoothquise walls to allow panel replacement

by the shoothouse walls to allow panel replacement.

11. The catwalk may be extended over other areas of the shoothouse if needed.

12. The electrical room is 2.032m (6'-8") wide and 0.8128m (2'-8") deep with a 1.8288m (6'-0") wide doors on the front to provide required access to data enclosure and panel board.

#### MECHANICAL

Ventilation cooling shall be provided for the electrical room. Provide exhaust fan with interlack to motorized louver/damper. Thermostat setpoint for activation of exhaust fan shall be 100 degrees F. Exhaust fan control sequence and thermostat setpoint of 100 degrees F shall be shown on design drawings. Locate fan and louver to optimize cross ventilation in the room.

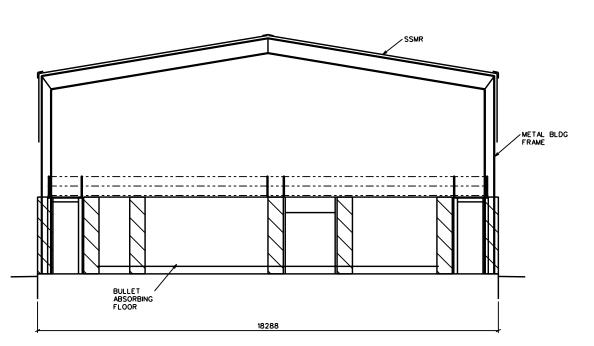
#### FIRE PROTECTION

Fire Protection is NOT required per fire codes for this building. Consult local Fire Marshall for compliance with local laws.

ELECTRICAL ROOM SEE NOTE 12

> BULLET ABSORBING WALL PANEL SEE NOTE 1





22860 (75'-0")

CORRIDOR 104 14650 X 2230 (48' X 7')

TRAINING ROOM 109

2740 X 3050 (9' X 10')

SHOOT HOUSE - FLOOR PLAN

BLOW PANEL 762 X 762

TRAINING ROOM

5490 X 3350 (18' X 11')

> TRAINING ROOM 107

3960 X 3050 (13' X 10')

TRAINING ROOM 108

3960 X 3050 (13' X 10')

15850 (52'-0"

T<u>RAINING ROO</u>M 102 4570 X 3350 (15' X 11')

2130 X 1370

BLOW PANEL

TRAINING ROOM

3350 X 3350

(11' X 11')

CATWALK ABOVE

TRAINING ROOM

4880 X 4880 (16' X 16')

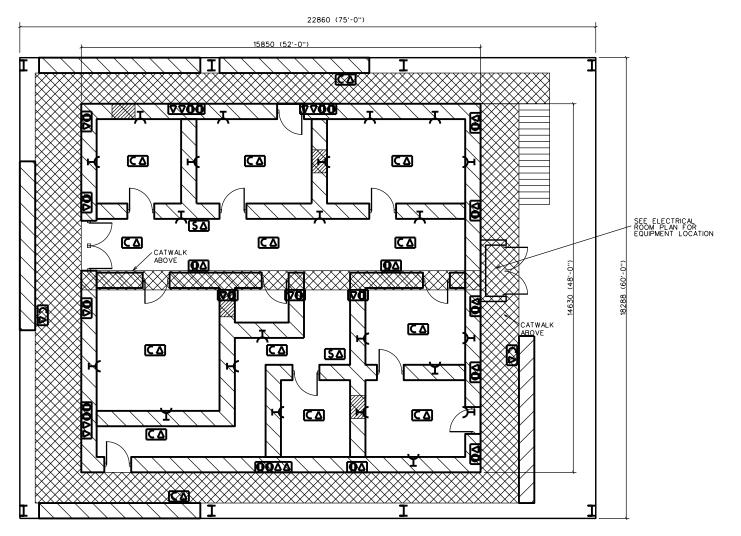
BUILDING SECTION

Thursday, February 07, 2013 Sheet reference number:

SHH-A-1

Page 48

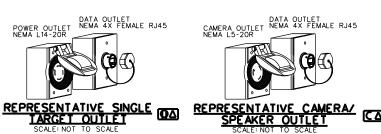


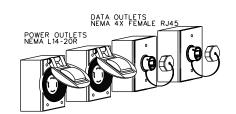


SHOOT HOUSE - TARGET OUTLET PLAN

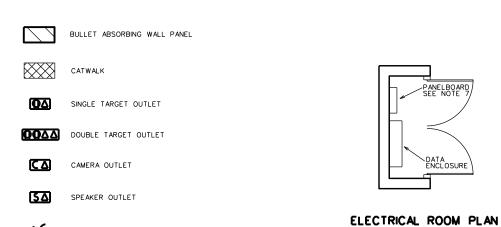
#### NOTES

- 1. ROUTE WIRE FOR POWER AND DATA TO UNIVERSAL TARGET OUTLETS UNDER THE CATWALK.
- 2. MOUNT THE CAMERA AND SPEAKER OUTLETS TO THE ROOF STRUCTURE AND MOUNT FOUR CAMERA OUTLETS UNDER THE CATWALK.
- 3. INSTALLATION OF TARGETS, CAMERAS, AND SPEAKERS BY OTHERS.
- 4. THE ELECTRICAL ROOM SHALL BE SEALED TO PREVENT WATER FROM ENTERING THE ROOM, AND SHALL BE CONSTRUCTED TO MINIMIZE DUST FROM ENTERING THE ROOM.
- 5. SAND FLOORS ARE NOT ALLOWED IN ELECTRICAL ROOM.
- 6. FIBER OPTIC CABLE ROUTED FROM THE AFTER ACTION REVIEW FACILITY SHALL BE TERMINATED IN THE DATA ENCLOSURE LOCATED IN THE ELECTRICAL ROOM.
- 7. LIGHTING PLAN NOT SHOWN ON THIS LAYOUT. TYPE OF LIGHTING FIXTURES USED SHALL BE DETERMINED BASED ON LOCAL ENVIRONMENTAL CONDITIONS AT THE SITE THE SHOOTHOUSE IS CONSTRUCTED. LIGHTS SHALL BE INSTALLED SUCH THAT THEY DO NOT INTERFERE WITH THE CAMERA SYSTEM THAT WILL BE MOUNTED TO THE ROOF STRUCTURE BY OTHERS. CONSIDERATION SHOULD BE GIVEN TO THE MOUNTING OF THE FIXTURES TO ALLOW FOR WINDY CONDITIONS THAT MAY BE PRESENT AT SOME LOCATIONS.
- 8. INSTALL LIGHTING CONTACTOR IN AN ENCLOSURE IN THE ELECTRICAL ROOM. THE INSTALLATION SHALL BE DONE IN ACCORDANCE WITH THE NEC. PROVIDE WITH A HAND-OFF-AUTO SWITCH TO ALLOW FOR BOTH LOCAL AND REMOTE CONTROL OF CONTACTOR.
- 9. LIGHTNING PROTECTION SHALL BE PROVIDED IN ACCORDANCE WITH NFPA 780.

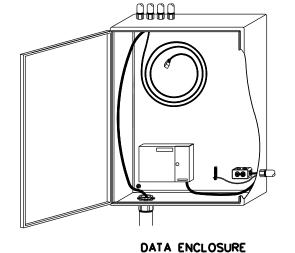




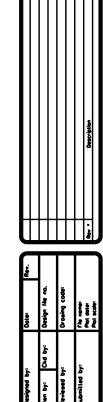
Representative Double Target Outlet



TARGET CABLE SUPPORT



- 1. DATA ENCLOSURE SHALL BE NEMA 4 RATED AND MAINTAIN NEMA RATING AFTER INSTALLATION.
- 2. DATA ENCLOSURE SHALL BE 4'HIGH X 3' WIDE X 10" DEEP.
- 3. FIBER OPTIC PATCH PANEL, MAXIMUM SIZE 9.5" HIGH X 13.5" WIDE.
- 4. 120V, 20A DUPLEX RECEPTACLE.
- 5. 2 METER SERVICE LOOP SHALL BE PROVIDED FOR ALL CABLES TERMINATING IN ENCLOSURE.
- 6. ROUTE SERVICE LOOP AROUND INSIDE PERIMETER OF ENCLOSURE. 7. ALL CABLES SHALL BE PERMANENTLY LABELED STATING CABLE DESTINATION.
- 8. METALLIC BACKPLATE SHALL BE INSTALLED THAT COMPLETELY COVER REAR OF ENCLOSURE. ALL COMPONENTS SHALL BE MOUNTED TO THIS BACKPLATE.
- 9. GROUND BACKPLATE WITH \*6 AWG CU CONDUCTOR
- 10.FIBER OPTIC TERMINATIONS SHALL BE MADE WITH SC CONNECTORS.
- 11.ENCLOSURE SHALL BE PROVIDED WITH A HINGED AND LOCKABLE DOOR.
- 12.REMAINING SPACE IN DATA ENCLOSURE SHALL BE USED FOR EQUIPMENT TO BE INSTALLED BY OTHERS.
- 13.12 STRAND FIBER OPTIC CABLE INSTALLED BETWEEN DATA ENCLOSURE AND WALL MOUNTED FIBER PATCH PANEL IN AAR.
- 14.INSTALL CAT6 UTP CABLES FROM TARGET, SPEAKER AND CAMERA OUTLETS INTO THE DATA ENCLOSURE. COIL 3FT AND TERMINATE WITH MALE RJ-45 CONNECTOR.



17879 DESIGN

reference SHH-E-

Thursday, February 07, 2013

#### W912QR-23413770 CERTIFIED FINAL-003

The After Action Review (AAR-SMALL) facility provides space for personnel to review training exercises. The facility is 1,064 square feet (98.85 square meters) in area. Space is also provided for the installation of required electronics and communications equipment to prepare the review presentations and control rooms to monitor the presentations. When this standard is used for a Live Fire Exercise Shoothouse it is also used as a ROC. The occupant load factor is 100 net square feet (9.3 net sq. meters) (per person) for the control room and 32 occupants for the classroom based on a business use. See NFPA 101 table 7.3.1.2. All dimensions not labeled are in feet and inches.

This standard definitive design should be adapted to local conditions such as climate, topography, seismic zone, available construction materials and techniques and the existing character of surroundings building. These factors may affect plans, elevations and building systems. The building foundation must be designed based on the results of a geotechnical investigation.

The design and construction must comply with applicable codes and standards including: technical instruction TI 800-01, "Design Criteria": Department of the Army regulations, technical manuals, handbooks, standards, and specifications.

A folding partition is provided in the classroom to provide the option for two smaller classrooms. The partition may be deleted based on installation requirements when the standard is used on a shoothouse. Two Offices are provided off of the Classroom. Windows in the office are double hung to meet functional requirements providing natural lighting and ventilations. Windows have forced entry resistant metal framed and are provided with insect screens. Provide polycarbonate security glazing in windows and doors. One way glazing is provided between the control rooms and the classrooms. Floors should be sealed concrete or vinyl tile for ease of cleaning. Ceilings should be finished gypsum board. Gutters, downspouts, and splash blocks should be provided where required by climatic conditions. Covered entries and ice guards may be necessary in northern climates.

The After Action Review (AAR) is accessed only by able-bodied personnel and does not require ADA compliance unless dictated by local criteria.

The Mechanical Equipment shall be selected and sized based on site requirements, local weather

The Mechanical Equipment shall be selected and sized based on site requirements, local weather design criteria, and available energy sources and building construction materials. U-factor requirements are based on the local climatic conditions in accordance with TI 800-1. The mechanical system must be sized to maintain equipment operating temperature of 74 F +/- 4 F in rooms containing range communication equipment. Obtain communication equipment heat release from targetry supplier for HVAC load calculations and equipment sizing. HVAC design for personnel comfort shall be in accordance with UFC 3-410-FA. Route ductwork to provide an even distribution of conditioned air throughout the building to meel occupant comfort and outdoor air requirements. Provide diffusers and dampers to allow for annual balancing.

The AAR shall be served by 120/240, 1 phase, 3-wire secondary power. Provide surge protective device for incoming service. Rigid steel conduit shall extend a minimum of 5' (1530mm) outside the building for power and communication circuits entering and leaving the building. Use recessed panel boards if installed in finished areas. Provide a lightning protection system in accordance with NFPA 780. Provide dedicated 120V, 20 amp, power circuits to both workstations installed in the AAR Development Room, Room 102; quad outlets 18" AFF. Provide 120V duplex receptacle in the celling for a projector in each classroom. Provide 120V duplex receptacles for a presentation podium in the front of each classroom (two total). Coordinate the requirements for the projector screens at the front of the classrooms, provide power if required. Provide an L5-30R outlet on a dedicated 120V, 30amp circuit mounted flush in the ceiling above each Data Termination Rack (DTR). Provide a complete 24" ladder type cable tray and conduit system for OPA installed cables interconnecting OPA installed equipment. The 24" cable tray shall extend from the DTR's to above each workstation. Conduit shall extend from the cable trays to the overhead projectors and presentation podiums in each classroom. Provide vertical cable tray sto blows above each DTR. Provide recessed 12"x4" vertical cable tray sections from the cable tray to each workstation with removable access faceplate 18"

each classroom. Provide vertical cable tray teleboxs above each DTR. Provide recessed 12 x4 vable tray sections from the cable tray to each workstation with removable access faceplate 18" AFF. Provide 4"x4" junction boxes recessed in the ceiling for each projector and in the wall for each podium with 1" conduits to the cable tray. For locations where training will occur at night provide separately switched red and white lighting on the exterior and in all room that have windows and doors opening to training areas.

Telephone service is not a requirement for range operations. However, service should be provided to the AAR if it is available in the area.

The targetry system requires a fiber optic connection between the ROC and the AAR. Most ranges will only require one Data Termination Rack, except the Shoothouse range which will require three racks (one MCA provided and two OPA provided).

Fire protection is not required per fire codes for this building. The fire alarm shall be a local audible alarm. Fire extinguisher's and cabinets are required per NFPA. Consult local Fire Marshall for compliance with local requirements. Provide a Mass Notification system per UFC.

General

Site Adaptation

Functional Requirements

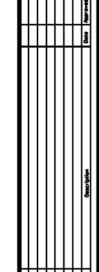
Electrical

Telephone

Targetry System Interface:

Page 48

¥¥ US Army Corps of Engineers



# 2 2 2 CENTER, HUNTSVELE U. S. ARM SUPPORT H.INT

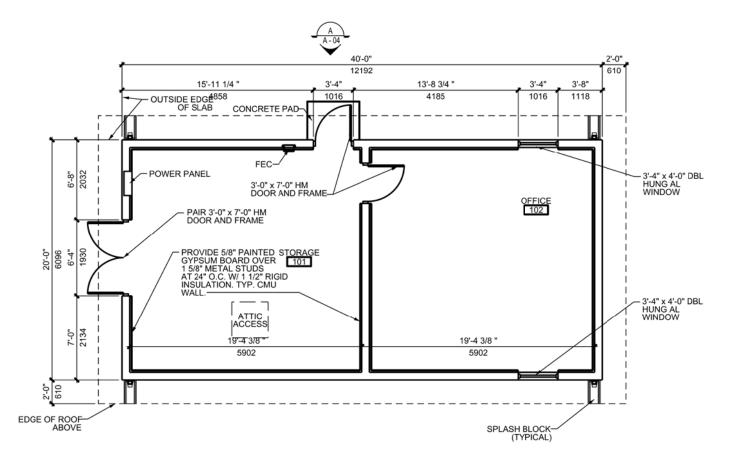
ACTION REVIEW (AAR) SMALL DESIGN AFTER

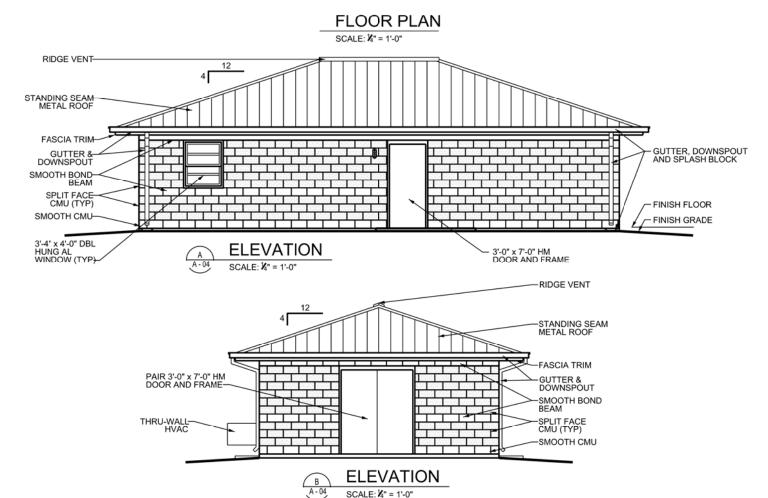
reference

A-12

GRAPHIC SCALE: 1/4"=1'-0"

Thursday, February 07, 2013







#### Site Adaptation

This standard definitive design should be adapted to local conditions such as climate, available construction materials and techniques, topography, seismic zone and the existing character of surrounding buildings. These factors may affect plans, elevations, and building systems. The building foundation must be designed based on the results of a geotechnical investigation.

#### Reference Criteria

The design and construction must comply with applicable codes and standards including: technical instruction TI 800-01. "Design Criteria" Departments of the Army regulations, technical manuals, handbooks, standards, and specifications.

#### Functional Requirements

All dimensions not labeled are in inches. Windows are double hung to meet All dimensions not labeled are in inches. Windows are double hung to meet functional requirements providing natural lighting and ventilation. Windows have forced entry resistant metal frames and are provided with insect screens. Provide polycarbonate security glazing in windows and doors. Gutters, downspouts and splash blocks should be provided where maintenance. Extend 6" (150mm) beyond edge of unit on three sides. Covered entries and ice guards may be necessary in northern climates. The office area should be provided with a finished ceiling.

The Operations/Storage Building is accessed only by able-bodied personnel and does not require ADA compliance unless by local criteria.

#### Mechanical

The Mechanical Equipment shall be selected and sized based on site requirements, local weather design criteria, available energy sources, and building construction materials. The HVAC system must maintain an equipment operating temperature of 74 F +/- 4 F in rooms containing range communication equipment. Obtain range communication equipment heat release from the User or targetry supplier for HVAC load calculations and equipment sizing, HVAC design for personnel comfort shall be in accordance with UFC 3-410-01FA. U-Factor requirements are based on the local climatic conditions in accordance with TI 880-1.

The Operations/Storage building shall be served by 120/240V, 1 phase, 3-wire secondary power. Provide Surge Protective Device (SPD) for incoming service. Rigid Steel conduit shall extend a minimum of 5' (1524mm) outside the building for power and communication circuits entering and leaving the building. Voltage drop shall comply with NEC standards and Army technical manuals. Grounding will be installed in accordance with NFPA 70 and other applicable standards.

The panelboard shall be 120/240V single phase, mounted inside the building and shall be recessed mounted in finished areas. Receptacles shall be general purpose, 120V, 20A Duplex mounted 18'(450mm) above the finish floor. All outlets receptacles and conduit shall be recess mounted. Provide 120/240V power the HVAC unit. Illumination levels will be designed in accordance with IES. Exterior lighting shall be provided with separate switching located near points of egress. Provide additional fixtures with red lamps next to all exterior fixtures and in all rooms with doors or windows that open to the training area for ranges where training will occur at night. Red lights shall be switched separate from white lights and there shall be provisions to prevent accidental illumination of white lights while red lights are in use.

The emergency electrical system shall comply with NFPA 70 and NFPA 101. Exit signs will be provided in accordance with NFPA 101. Emergency lighting shall be provided to ensure adequate illuminations to egress building in the event of a power outage.

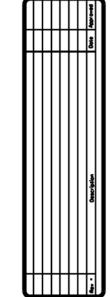
Perform lightning protection risk assessment in accordance with NFPA 780 to determine the need for lightning protection.

Telephone service is not a requirement for range operations. However should be provided to the Ops/Stg Building if it is available in the area.

#### Fire Protection

Fire protection is not required per fire codes for this building. The fire alarm shall be a local audible alarm. Fire extinguisher's and cabinets are required per NFPA. Consult local Fire Marshall for compliance with local requirements. Provide a Mass Notification system per UFC.

The Operations/Storage Building provides office space for range personnel and stores supplies, spare ports and tools. Target maintenance is also accomplished in the facility. There is a single office of approx. 400 sq feet and a storage area of 400 sq feet for a combined total building size of 800 square feet. Storage / Office partition will vary based on user's requirements. The occupant load factor is 100 net sq. feet (9.3 net sq. meters) per person based on a business use. See NFPA 101 table 7.3.1.2.



 $\mathbb{R}^{*}$ 

US Army Corps of Engineers

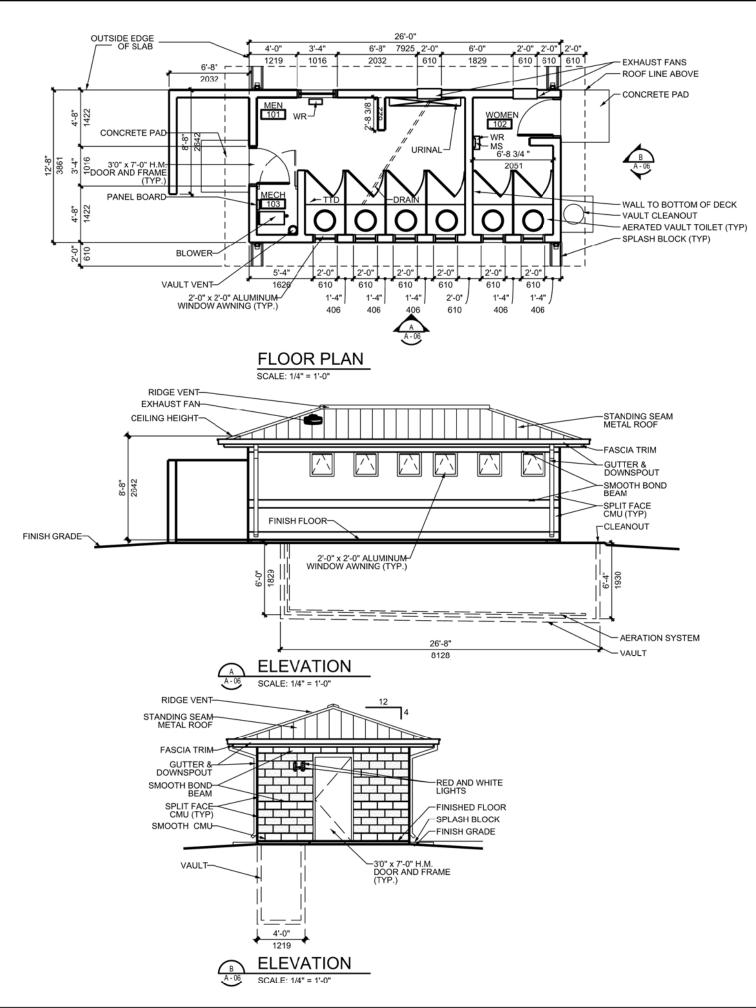
OPERATIONS /STORAGE BUILDING E AND TRAINING LA STANDARD DESIGN

Thursday, February 07,

GRAPHIC SCALE: 1/4"=1'-0"

reference number: A-04

12



#### General

The Latrine - Aerated Vault provides restroom facilities for men and women. The latrine will accommodate a training unit of up to 190 men and 35 women based on OSHA standards. The aerated vault is constructed beneath the building.

#### Site Adaptation

This standard definitive design should be adapted to local conditions such as climate, available construction materials and techniques, topography, seismic zone, and the existing character of surrounding buildings. These factors may affect plans, elevations, and building systems. The building foundation must be designed based on the results of a geotechnical investigation.

Alternative environmentally friendly latrine designs other than the Aerated Vault are allowable. Possibilities include, portable commercial latrines on concrete pads with optional wind screen walls, composting latrines, or other locally available commercial units.

#### Reference Criteria

The design and construction must comply with applicable codes and standards including: technical instruction TI800-01, "Design Criteria" Department of the Army regulations, technical manuals, handbooks, standards and specifications.

#### Functional Requirements

All dimensions are in feet and inches unless otherwise noted. Windows are bottom hung in-swing to meet functional requirements, providing natural lighting and ventilation. Windows have forced entry resistant metal frames and are provided with insect screens. Provide polycarbonate security glazing in windows. An 18-gauge diamond mesh partition 8-0'(2438 mm) high with a 2'-6'(762 mm) x 7'-0' (2133 mm) diamond mesh door encloses the mechanical area. Gutters, downspouts and splash blocks should be provided where required by climatic conditions. Covered entries and ice guards may be necessary in northern climates. Floors should be sealed for ease of cleaning. Ceilings should be finished!

#### Mechanical

Vault latrines shall have no comfort cooling, but may have unit heaters to prevent the latrine temperature from dropping below 45 degrees F in mild climate regions and 20 degrees F in extremely cold climate regions. The unit heater shall be controlled by the light switch. Two types of Vault Latrines are used, 'Wet Vault Latrines' and 'Dry Vault Latrines'.

Wet vault latrines shall be provided with a roof mounted exhaust fan capable of moving 50 cfm per water closet and urinal from the vault. Stainless Steel ductwork shall extend from the exhaust fan to an elevation 6-inches blow the rim of the vault. Wall or door luvers shall be installed one in the Men's and one in the Women's Latrine to provide cross ventilation make-up air. Each louver shall be sized based on its open area to flow equal velocity as calcuated by the number of fixtures served. The stools provided over the vault shall be stainless steel and shall have a seat withno cover. The air flow pattern enters the louver, cross-ventilates the latrine, passes through the stool to enter the vault and is removed from the vault by the exhaust fan. The exhaust fan shall operate continuously. Ventilation practice for the dry vault is expectly the same expect the flow operate continuously. Ventilation practice for the dry vault is exactly the same except the flow rate shall be calculated at a rate of 70 cfm per fixture.

#### Wet Vault Latrine Aerobic Air Supply System

The wet vault latrine shall be provided with an aeration system that is comprised of an oil-free, lobe or vane type air blower. This air blower shall under normal latrine usage sites provide 5 cfm to 20 cfm of air flow at a pressure of 15 psig to 5 psig. The above vault pipe material shall be 3/4" galvanized steel, which shall be connected to 3/4" Schedule 40 PVC pipe using a flexible hose of approximately 2 feet long to connect the two pipes. The PVC pipe shall extend to an elevation 6" above the bottom of the vault and elbow into and aeration header. The aeration header shall extend to within 6-inches of each end of the vault, be centered in the vault, and be supported from the bottom of the vault by 6" using tees, elbows and PVC pipe. The supports shall be placed at each end of the header and space no greater than 7 feet on center. The aeration headed shall have 1/8" diameter holes drilled staggered 2" on center one hole on the left and one hole on the right in the bottom 1/4 of the pipe. Alternate air diffusion devices are manufactured and may be used instead of the distribution header.

The Latrine shall be served by 120/240V, 1 phase, 3-wire secondary power. Provide Surge Protective Device (SPD) for incoming service. Rigid Steel conduit shall extend a minimum of 5' (1524mm) outside the building for power and communication circuits entering and leaving the building. Voltage drop shall comply with NFPA 70 standards and Army technical manuals. Grounding will be installed in accordance with NFPA 70 and other applicable standards. The panelboard shall be 120/240V single phase, mounted inside the building and shall be recessed mounted in finished areas. Receptacles shall be general purpose, GFCI, 120V, 20A Duplex mounted 18'(450mm) above the finish floor. All outlets receptacles and conduit shall be recess mounted. Provide 120/240V power the HVAC unit.

Provide 120/240V power the HVAC unit. Illumination levels will be designed in accordance with IES. Exterior lighting shall be provided with separate switching located near points of egress. Provide additional fixtures with red lamps next to all exterior fixtures and in all rooms with doors or windows that open to the training area for ranges where training will occur at night. Red lights shall be switched separate from white lights and there shall be provisions to prevent accidental illumination of white lights while red lights are in use.

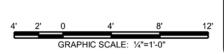
The emergency electrical system shall comply with NFPA 70 and NFPA 101. Exit signs will be provided in accordance with NFPA 101. Emergency lighting shall be provided to ensure adequate illuminations to egress building in the event of a power outage.

Perform lightning protection risk assessment in accordance with NFPA 780 to determine the need for lightning protection.

Fire protection is not required per fire codes for this building. The fire alarm shall be a local audible alarm. Fire extinguisher's and cabinets are required per NFPA. Consult local Fire Marshall for compliance with local requirements. Provide a Mass Notification system per UFC.

MS- Mirror with shelfTTD- toilet tissue dispenserWR- waste receptacle

Thursday, February 07,

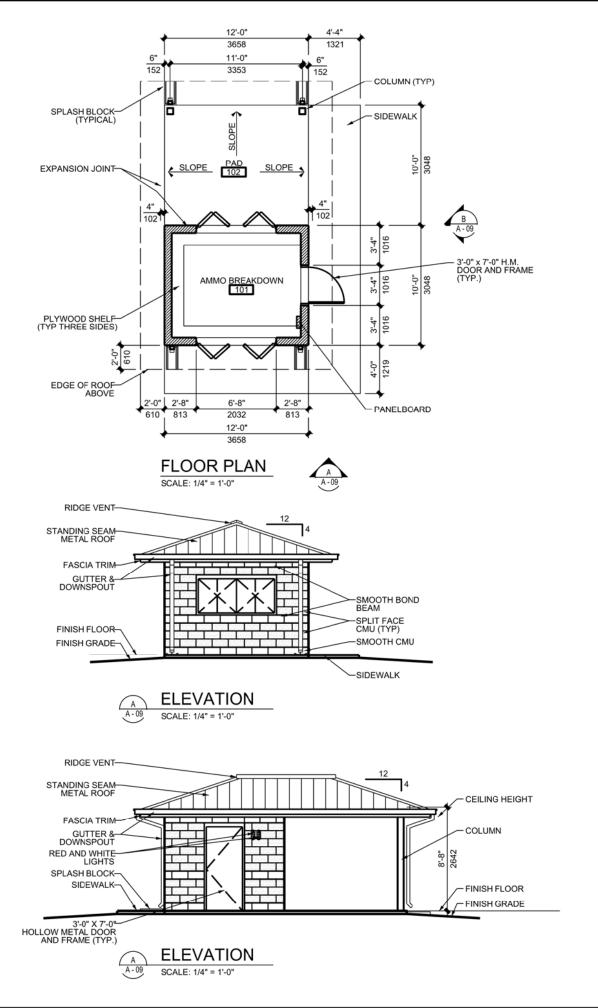


 $\mathbb{H}$ US Army Corps of Engineers



VAULT LATRINE AERATED DESIGN WITH

reference number: A-06



#### General

The Ammunition Breakdown Building provides space for breaking down and issuing ammunition to the personnel involved in range training exercises. Although the building is not intended for ammunition storage, if end user determines that storage of ammunition may be required, the design must meet the requirements of DA PAM 385-64. A canopy is provided at one of the issuing windows to protect personnel during periods of inclement weather. The enclosed area required for the ammunition breakdown building is 184 square feet (17.1 square meters).

#### Site Adaptation

This standard definitive design should be adapted to local conditions such as climate, available construction materials and techniques, topography, seismic zone and the existing character of surrounding buildings. These factors may affect plans, elevations, and building systems. The building foundation must be designed based on the results of a geotechnical investigation. The siting of this building shall be in accordance with Small Arms Explosive Safety requirements DA PAM 385-64. Buildings should be a minimum of 50 feet from all other buildings and 100 feet from occupied buildings. occupied buildings.

#### Reference Criteria

The design and construction must comply with applicable codes and standards including: technical instruction TI 800-01. "Design Criteria" Departments of the Army regulations, technical manuals, handbooks, standards, and specifications.

#### Functional Requirements

All dimensions not labeled are in feet and inches. Issuing windows are hollow metal door panels secured with flush bolts and overlapping astragals. Windows have forced entry resistant metal frames. Gutters, downspouts and splash blocks should be provided where required by climatic conditions, lee guards may be necessary in northern climates. Ceilings should be finished.

The Ammo Breakdown Building is accessed only by able-bodied personnel and does not require ADA compliance unless by local criteria.

#### Mechanical

No mechanical systems are required for the Ammo Breakdown Building.

The Ammo Breakdown Building shall be served by 120/240V, 1 phase, 3-wire secondary power. Rigid Steel conduit shall extend a minimum of 5' (1524mm) outside the building for power and communication circuits entering and

outside the building for power and communication circuits entering and leaving the building. The panelboard shall be 120/240V single phase, mounted inside building. Illumination levels will be designed in accordance with IES. Fixtures with red lamps on separate switching shall be placed near each white incandescent lamp. Incandescent fixtures shall be gasket, vapor proof enclosed with guard. Exterior white and red lighting shall be provided with separate switching located near the points of egress.

Explosion-proof fixtures: Fixtures are not required to be explosion proof unless end users determine that there is a need to store ammunition in the facility.

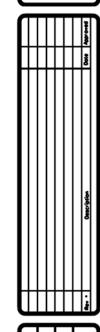
A telephone system is not required.

Mast type lightning protection in accordance with DA PAM 385-64 is required for this building.

#### Fire Protection

Fire protection is not required per fire codes for this building. The fire alarm shall be a local audible alarm. Fire extinguisher's and cabinets are required per NFPA. Consult local Fire Marshall for compliance with local requirements. Provide a Mass Notification system per UFC.



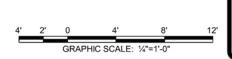


AMMUNITION BREAKDOWN BUILDING E AND TRAINING LAND PRO STANDARD DESIGN MANUAL

reference number:

A-09

Thursday, February 07,



# APPENDIX K Fuel Cost Information

The following utility rates for this installation are provided for design

#### **Electrical:**

Demand Charge -

Summer Demand Rate (June-Sept) - \$23.87/kW Winter Demand Rate (Dec-Mar) - \$17.72/kW Transition Period (Apr, May, Oct, Nov) - \$13.12/kW

### Energy Charge -

Summer (June-Sept) - \$0.03710/kWh Winter (Dec-Mar) - \$0.03355/kWh Transition Period (Apr, May, Oct, Nov) - \$0.03277/kWh

Blended Rate - \$0.07101/kWh

#### **Natural Gas:**

Commodity Charge Rate - \$8.072 per thousand cubic feet

#### Water:

Commodity Charge Rate - \$3.00 per 1,000 gal

#### Sewer:

Commodity Charge Rate - \$3.00 per 1,000 gal

### **APPENDIX L**

## **LEED Project Credit Guidance**

This spreadsheet indicates Army required credits, Army preferred credits, project-specific ranking of individual point preferences, assumptions guidance for individual credits, and references to related language in the RFP for individual credits.

LEED Credit Paragraph	LEED Project Credit Guidance FEATURE	Army Guidance: Required - Preferred - Avoid	Project Preference Ranking: (1=most preferred, blank=no preference, X=preference not applicable to this credit, Rqd=required)	REMARKS
FAR	FEATURE			KEWIAKNO
SUSTAINABLE SITES		Γ	Ι	
SSPR1	Construction Activity Pollution Prevention (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
SS1	Site Selection		Х	See paragraph LEED CREDITS COORDINATION.

SS2	Development Density & Community Connectivity - OPTION 1 DENSITY  Development Density & Community		X	See paragraph LEED CREDITS COORDINATION.  See paragraph LEED
	Connectivity - OPTION 2 CONNECTIVITY		Х	CREDITS COORDINATION.
SS3	Brownfield Redevelopment		X	See paragraph LEED CREDITS COORDINATION.
SS4.1	Alternative Transportation: Public Transportation Access		X	See paragraph LEED CREDITS COORDINATION.
SS4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	Pref	~	Bike racks are prohibited at certain facilities, as indicated in Statement of Work. Assume that non-transient building occupants are NOT housed on Post unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 1			Requires provision of vehicles, which cannot be purchased with construction funds. Assume Government will not provide vehicles unless indicated otherwise. Assume that 50% of GOV fleet is NOT alternative fuel vehicles unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 2	Pref		
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 3			Requires provision of vehicle refueling stations. Installation must support type of fuel and commit to maintaining/supporting refueling stations.

1				
	Alternative Transportation: Parking			
SS4.4	Capacity	Pref		
007.4	Site Development: Protect or			
SS5.1	Restore Habitat			Assume AGMBC option
				for aggregated open
				space at another location on the installation is not
				available to the project
SS5.2	Site Development: Maximize Open	Pref		unless indicated otherwise.
333.2	Space	Piei		See paragraph
				STORMWATER
SS6.1	Stormwater Design: Quantity Control	Pref		MANAGEMENT AND LOW IMPACT DESIGN.
	Standard Soligni Quantity Control	. 151		See paragraph
				STORMWATER MANAGEMENT AND
SS6.2	Stormwater Design: Quality Control	Rqd		LOW IMPACT DESIGN.
SS7.1	Heat Island Effect: Non-Roof			
				See paragraph SITE
SS7.2	Heat Island Effect: Roof	Pref		SELECTION
SS8	Light Pollution Reduction	Pref		
	Eight Fondion Roadon	1 101		
		<u> </u>	<u> </u>	
WATER EFFICIENCY				
	Water Use Reduction (Version 3			All LEED prerequisites
WEPR1	only)	Rqd	Rqd	are required to be met.
				See paragraph IRRIGATION. Project
				must include landscaping
WE1	Water Efficient Landscaping:	Rqd		to be eligible for this credit.
VV 1	water Emoient Landscaping.	riqu		orouit.
	Innovative Wastewater			
WE2	Technologies - OPTION 1			
	Innovative Wastewater			
WE2	Technologies - OPTION 2			See paragraph
				PLUMBING AND WATER
WE3	Water Use Reduction	Rqd		CONSUMING

				EQUIPMENT.
ENERGY AND ATMOSF	PHERE			
	Fundamental Commissioning of the			
EAPR1	Building Energy Systems (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR2	Minimum Energy Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR3	Fundamental Refrigerant Management (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EA1	Ontimiza Energy Performance	Dad	1	Earning of LEED EA1 points as indicated in paragraph ENERGY CONSERVATION, as a minimum, is required.
EAT	Optimize Energy Performance	Rqd	1	
EA2	On-Site Renewable Energy	Pref		See paragraph ENERGY CONSERVATION.
EA3	Enhanced Commissioning			See paragraph COMMISSIONING.
EA4	Enhanced Refrigerant Management			See paragraph MATERIALS AND RESOURCES.
EA5	Measurement & Verification	Rqd		Assume Government will not provide post-occupancy activities unless indicated otherwise.
EA6	Green Power		X	See paragraph LEED CREDITS COORDINATION.
	Green ower			CONDINATION.
	,	•		1
MATERIALS AND RESC	DURCES			

MRPR1	Storage & Collection of Recyclables (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Coordinate with Installation during design development on collection service and receptacles.
MR1	Building Reuse			
WILL.	Ballating House			
MR2	Construction Waste Management:	Rqd		See paragraph CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.
MR3	Materials Reuse  Recycled Content:	Pref		See paragraph MATERIALS AND RESOURCES.
MR5	Regional Materials			See paragraph MATERIALS AND RESOURCES.
	riogional materiale			
MR6	Rapidly Renewable Materials	Pref		See paragraph MATERIALS AND RESOURCES.
MR7	Certified Wood	Pref		See paragraph MATERIALS AND RESOURCES.
INDOOR ENVIRONMENTAL	_ QUALITY			
EQPR1	Minimum IAQ Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EQPR2	Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Assume all buildings are smoke free unless indicated otherwise (family housing, barracks and other lodging are facility types where smoking may be

Section:	APPENDIX L	
OCCHOIL.		_

			permitted in some cases).
			See paragraph
EQ1	Outdoor Air Delivery Monitoring		BUILDING INTERIOR.
EQ2	Increased Ventilation		
EQ3.1	Construction IAQ Management Plan: During Construction	Pref	See paragraph BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT.
EQ3.2	Construction IAQ Management Plan: Before Occupancy	Pref	See paragraph BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT.
	Low Emitting Materials: Adhesives &		See paragraph DAYLIGHTING AND LOW EMITTING MATERIALS
EQ4.1	Sealants	Pref	0
EQ4.2	Low Emitting Materials: Paints & Coatings	Pref	See paragraph DAYLIGHTING AND LOW EMITTING MATERIALS
EQ4.3	Low Emitting Materials: Carpet/Flooring Systems	Pref	See paragraph DAYLIGHTING AND LOW EMITTING MATERIALS
EQ4.4	Low Emitting Materials: Composite Wood & Agrifiber Products	Pref	See paragraph DAYLIGHTING AND LOW EMITTING MATERIALS
EQ5	Indoor Chemical & Pollutant Source Control	Pref	System requiring weekly cleaning to earn this credit is not a permitted option unless indicated otherwise.
EQ6.1	Controllability of Systems: Lighting		
EQ6.2	Controllability of Systems: Thermal Comfort		
EQ7.1	Thermal Comfort: Design	Rqd	See paragraph DAYLIGHTING AND LOW EMITTING MATERIALS.
EQ7.2	Thermal Comfort: Verification		Project must earn credit EQ7.1 to be eligible for this credit. Assume

EQ8.1	Daylight & Views: Daylight 75% of Spaces	Pref		Government will not provide post-occupancy activities unless indicated otherwise  See paragraph DAYLIGHTING AND LOW EMITTING MATERIALS.
EQ8.2	Daylight & Views	Pref		
INNOVATION & DESIGN PI	ROCESS			See paragraph
IDc1.1	Innovation in Design			INNOVATION AND DESIGN CREDITS AND REGIONAL PRIORITY CREDITS. Assume Government will not provide any activities associated with ID credits.
IDc1.2	Innovation in Design			
IDc1.3	Innovation in Design			
IDc1.4	Innovation in Design			
IDc2	LEED Accredited Professional	Rqd	Rqd	LEED AP during design and construction is required.
REGIONAL PRIORITY CREDITS (Version 3 only)				See paragraph LEED CREDITS COORDINATION.

04 MAY 10

Appendix M

# Owner's Project Requirements Document for LEED Fundamental Commissioning

Project: F	t Campbell Live Fire Shoot	<u>house</u>	
Approved:	Name	Owner's Representative	Date
	Name	Design Agent's Representative	Date

#### **Overview and Instructions**

The purpose of this document is to provide clear and concise documentation of the Owner's goals, expectations and requirements for commissioned systems, and shall be utilized throughout the project delivery and commissioning process to provide an informed baseline and focus for design development and for validating systems' energy and environmental performance.

The Owner's Project Requirements Document is a required document for LEED-NC EA Prerequisite Fundamental Commissioning of the Building Energy Systems. It shall be completed by the Corps District/Design Agent based on coordination with the Installation/User/Proponent and shall be approved by the Installation/User/Proponent representative.

The intent of the Owner's Project Requirements Document is to detail the functional requirements of a project and the expectations of the building's use and operation as it relates to commissioned systems. This template contains the basic recommended components indicated in the LEED Reference Guide. It should be adapted as needed to suit the project, remaining reflective of the LEED intent.

The Owner's Project Requirements Document should ideally be completed before the start of design and furnished to the design team. It must be completed prior to the approval of Contractor submittals of any commissioned equipment or systems to meet LEED requirements.

Updates to the Owner's Project Requirements Document throughout the course of project delivery shall be made by the Corps District/Design Agent based on decisions and agreements coordinated with and agreed to by the Installation/User/Proponent.

The Owner's Project Requirements Document shall be included in the project's LEED documentation file under EA PR1, Fundamental Commissioning of the Building Energy Systems.

# Owner's Project Requirements Document for LEED Fundamental Commissioning **Table of Contents**

- 1. Owner and User Requirements
  - Primary Purpose, Program and Use
  - **Project History**
  - **Broad Goals**
- 2. Environmental and Sustainability Goals
  - **Energy Efficiency Goals**
  - General
  - Siting

Section: APPENDIX M

- **Building Façade**
- **Building Fenestration**
- **Building Envelope**
- Roof
- Other
- 3. Indoor Environmental Quality Requirements
  - Intended Use
  - Occupancy Schedule
  - Accommodations for After-Hours Use
  - Lighting, Temperature, Humidity, Air Quality, Ventilation, Filtration

  - Occupant Ability to Adjust System Controls
  - Types of Lighting
- 4. Equipment and Systems Expectations
  - Space Heating
  - Ventilation
  - Air Conditioning
  - Refrigeration
  - HVAC Controls
  - Domestic Hot Water
  - **Lighting Controls**
  - **Daylighting Controls**
  - **Emergency Power**
  - Other
- 5. Building Occupant and O&M Personnel Requirements
  - **Facility Operation**
  - **EMCS**
  - Occupant Training and Orientation
  - O&M Staff Training and Orientation

TABLE 1

W912QR-23413770 CERTIFIED FINAL-003 Page 496 of 947

04 MAY 10

1.	Owner and User Requirements	

What is the primary purpose, program and use of this project? (example: office building with Army Training Range
Describe pertinent project history. (example: standard design development)
Project is a standard design Live Fire Shoothouse.
Broad Goals
What are the broad goals relative to program needs?
What are the broad goals relative to future expansion?
What are the broad goals relative to flexibility?
What are the broad goals relative to quality of materials?
What are the broad goals relative to construction costs?
What are the broad goals relative to operational costs?
Other broad goals: (Insert as applicable)

Env	ronmental and Sustainability Goals	
	the project goals relative to sustainability and environmental issues? (example: LEE)	<b>)</b> Si
hat are	he project goals relative to energy efficiency? (example: Meet EPACT)	
hat are	he project goals and requirements for building siting that will impact energy use?	
hat are	he project goals and requirements for building facade that will impact energy use?	
hat are	he project goals and requirements for building fenestration that will impact energy u	  ise?
hat are	he project goals and requirements for building envelope that will impact energy use	?
hat are	he project goals and requirements for building roof that will impact energy use?	
	sert as applicable)	_

# 3. Indoor Environmental Quality Requirements

apparent from the space name, provide this information in Table 1.
What is the anticipated occupancy schedule (numbers of occupants and time frames) for all occupied spaces? Indicate the default occupancy schedule below and for all spaces that have an occupancy schedule that differs from the default, provide this information in Table 1.
What accommodations for after-hours use are required? (example: access control, lighting controls, HVAC controls) Indicate general accommodations required below and for all spaces that have special requirements, provide this information in Table 1.
What are the lighting, temperature, humidity, air quality, ventilation and filtration requirements for all spaces? Indicate the default requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.
Lighting: Temperature:
Humidity:Air Quality:
Ventilation:Filtration:
What are the acoustical requirements for all spaces? Indicate the default acoustical requirements below and for all spaces that have a requirement that differs from the default, provide this information in Tabl 1.
What is the desired level of occupant ability to adjust systems controls? Indicate the default desired levels below and for all spaces that have a desired level that differs from the default, provide this information in Table 1.
Lighting:

W912QR-23413770 CERTIFIED FINAL-003 Page 499 of 947

04 MAY 10

Temperature:
Humidity:
Air Quality:
Ventilation:
What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)
4. Equipment and System Expectations
(Complete for each category as applicable or indicate "none identified" or "N/A". Add desired features information for other anticipated commissioned systems as applicable)
Indicate desired features for the following commissioned system: Space Heating
Desired Type:
Quality:
Preferred Manufacturer:
Flexibility: Maintenance Requirements:  Efficiency Target:
Desired Technologies:
Indicate desired features for the following commissioned system: Ventilation  Desired Type:
Quality:
Preferred Manufacturer:
Flexibility: Maintenance Requirements:  Efficiency Target:
Desired Technologies:

Indicate desired features for the following commissioned system: Air Conditioning

W912QR-23413770 CERTIFIED FINAL-003 Page 500 of 947

04 MAY 10

Desired Type:
Quality:
Preferred Manufacturer:
Flexibility:  Maintenance Requirements:  Efficiency Target:
Desired Technologies:
Indicate desired features for the following commissioned system: Refrigeration
Desired Type:
Quality:
Flexibility:  Maintenance Requirements:  Efficiency Target:
Desired Technologies:
Indicate desired features for the following commissioned system: HVAC Controls
Desired Type:
Quality:
Preferred Manufacturer:
Flexibility:
Desired Technologies:
Indicate desired features for the following commissioned system: Domestic Hot Water  Desired Type:
Quality:
Preferred Manufacturer:

W912QR-23413770 CERTIFIED FINAL-003 Page 501 of 947

04 MAY 10

Flexibility:
Maintenance Requirements:
Efficiency Target:
Desired Technologies:
Desired Technologies.
Indicate desired features for the following commissioned system: Lighting Controls
Desired Type:
Quality:
Preferred Manufacturer:
Reliability:
Automation:
Flexibility:
Efficiency Target:
Desired Technologies:
Indicate desired features for the following commissioned system: Daylighting Controls
Desired Type:
Quality:
Preferred Manufacturer:
Reliability:
Automation:
Flexibility:
Efficiency Target:
Desired Technologies:
Desired Technologies.
Indicate desired features for the following commissioned system: Emergency Power
Desired Type:
Quality:
Preferred Manufacturer:
Reliability:
Automation:
Flexibility:  Maintenance Requirements:
Efficiency Target:
Desired Technologies:

Indicate desired features for the following commissioned system: Other
Desired Type:
Quality:
Preferred Manufacturer:
Flexibility:
Desired Technologies:
5. Building Occupant and O&M Personnel Requirements
How will the facility be operated? Who will operate the facility?
Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)
What is the desired level of training and orientation for building occupants to understand and use the building systems?
What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?

Table 1

Space	Use / Activity	Num of Occs	Special Occupancy Schedule	After Hours Use Reqmt.	Special Cooling Reqmt.	Special Heating Reqmt.	Special Humidit y Reqmt.	Special Ventil./Filtration Reqmt.	Special Acoustic Reqmt.	Special Lighting Reqmt.	Special Occup Adjustability Reqmt.
Ammo Breakdown	Training	NA	NA	Possible	NA	NA	NA	NA	NA	NA	NA
Operations Storage	Training	NA	NA	Possible	NA	NA	NA	NA	NA	NA	NA
After Action Review	Training	NA	NA	Possible	NA	NA	NA	NA	NA	NA	NA
Vault Latrine	Training	NA	NA	Possible	NA	NA	NA	NA	NA	NA	NA
Shoothouse	Training	NA	NA	Possible	NA	NA	NA	NA	NA	NA	NA

#### Section: APPENDIX N

#### **APPENDIX N**

#### LEED Requirements for Multiple Contractor Combined Projects (29 Sep 09)

When site work and building(s) for a project are accomplished by separate contractors, it is referred to as a Combined Project for purposes of LEED scoring and documentation and the following is required:

- LEED points relating to site work must be combined with the LEED points for each building to arrive at a single LEED Combined Project score.
- LEED points having both building requirements and site requirements (combined bldg/site points) must be coordinated between the contractors.
- LEED aggregate materials points must be coordinated between the contractors and a division of responsibilities for each contractor's required contribution to the point must be developed.
- LEED Project documentation from separate contractors must be combined.

Multiple Contractor Combined Project Definition. See paragraph MULTIPLE CONTRACTOR COMBINED PROJECT in paragraph PROJECT SPECIFIC REQUIREMENTS of the Statement of Work to see if this project is part of a Multiple Contractor Combined Project. A summary of the separate projects that constitute the Combined Project may be provided at paragraph SUSTAINABLE DESIGN – ADDITIONAL INFORMATION or may be obtained from the Contracting Officer's Representative. Typical Multiple Contractor Combined Projects are comprised of the site work contract and all the building-only contracts for buildings that the site work is provided for in the separate site work contract.

**LEED Points Coordination.** See Appendix LEED Multiple Contractor Responsibilities Table(s) for the total number of points each contractor is responsible for obtaining, for special requirements relating to combined building/site points and for each contractor's requirement relating to aggregate materials points each portion of this Multiple Contractor Combined Project. Each contractor providing a building is referred to as Building CTR and Site CTR refers to the contractor providing the site development. For each building included in the site work contract, the site work contractor is both Building CTR and Site CTR for that building. Aggregate materials percentages indicated in the table(s) are percentage of that contractor's materials total.

**Point Substitutions.** During preparation of the Proposal, each contractor is free to substitute other LEED points for those indicated in the LEED Multiple Contractor Responsibilities Table(s), except points marked "NO" in the "Building CTR Substitutions Permitted" column may not be deleted or added by substitution by building contractor and points marked "NO" in the "Site CTR Substitutions Permitted" column may not be deleted or added by substitution by site contractor. Credit substitutions after award are not permitted except with the advance approval of the Contracting Officer.

**LEED Documentation.** Each contractor is responsible for developing all project LEED documentation demonstrating compliance for their portion of the work and must utilize the LEED Letter Templates. Each contractor is responsible for updating construction phase LEED documentation at least monthly until construction closeout. No CTR will duplicate the data of another CTR within their own documentation. Each contractor will include the contractor name, project name and number and individual building description as applicable on each Letter Template. The LEED Letter Templates are copyright protected and shall be used only for this specific contract and this registered project.

Compiling LEED Documentation from Multiple Contractors. At completion and acceptance of final design submittals the completed design phase letter templates and their attachments from all CTRs in the Multiple Contractor Combined Project will be compiled at the registered site project. All CTRs will furnish electronic copies of their completed letter templates and their attachments for this purpose. Monthly during construction and at construction closeout all CTRs current construction phase letter templates and their attachments will be compiled at the registered site project. Summary letter templates for all aggregate credits (see AGMBC for which credits are aggregate credits) will be created and maintained monthly with summary data from all from

all CTRs in the Multiple Contractor Combined Project at the registered site project. All CTRs will furnish electronic copies of the current updated templates and their attachments for this purpose monthly and at

Site Work Portion of Multiple Contractor Combined Project, Administration by the Government. If paragraph 16.4.2 CREDIT VALIDATION indicates this is the site work portion of a Multiple Contractor Combined Project and that administration of the online project is by the Government, the Government will provide access to blank Letter Templates for site CTRs use and the Government will perform the compiling indicated in paragraph Compiling LEED Documentation from Multiple Contractors above.

Site Work Portion of Multiple Contractor Combined Project, Shared Administration. If paragraph 16.4.2 CREDIT VALIDATION indicates this is the site work portion of a Multiple Contractor Combined Project and that administration of the online project is shared between Contractor and Government, the Contractor will administer the registered site project until final design acceptance, at which point administration will be transferred to the Government. The Government will administer the project during construction and the Government will perform the compiling indicated in paragraph Compiling LEED Documentation from Multiple Contractors above.

Site Work Portion of Multiple Contractor Combined Project, Administration by the Contractor. If paragraph 16.4.2 CREDIT VALIDATION indicates this is the site work portion of a Multiple Contractor Combined Project and that administration of the online project is by the Contractor, the Contractor will administer the project and the Contractor will perform the compiling indicated in paragraph Compiling LEED Documentation from Multiple Contractors above.

Standard Design Building(s) portion of Multiple Contractor Combined Project, Administration by the Government. If paragraph 16.4.2 CREDIT VALIDATION indicates this is a standard design building(s) portion of a Multiple Contractor Combined Project and that administration of the online project is by the Government, the Government will provide access to blank Letter Templates for standard design building CTRs use as follows:

#### Instructions for Obtaining LEED Letter Templates for Registered Army Standard Designs

**General.** Contractors providing Army standard design buildings only (site work by another contractor) in a Multiple Contractor Combined project obtain their LEED Letter Templates for the project from the Center of Standardization (COS) for that standard design.

**Information You Need to Provide.** After award, contact the COS POC indicated below requesting LEED Letter Templates for your project. In your request, indicate the following:

Project name, location, Contractor name, PN number and contract number

Description of building(s) you are responsible for (example: S/M/L/L COF w/detached admin)

LEED Documentation Responsible Party name, phone number, email contact info

Responsible party certification of understanding that Letter Templates furnished by the Government for this project are copyright protected and will not be used for any purposes other than for this project documentation.

Attach the LEED Registered Project Checklist from conformed proposal which indicates the points the project will earn/contribute to.

#### **SAMPLE EMAIL REQUEST:**

To: (COS POC below)

Section: APPENDIX N

closeout.

CC: (Contracting Officer's Representative (COR) for your contract)

Subject: COS LEED Letter Templates Request

We have an awarded contract and request COS LEED Letter Templates for:

**Project:** 4<sup>th</sup> BCT Complex **Location:** Fort Bragg, NC

Contractor: Great Design Builder Inc.

Section: APPENDIX N W912QR-23413770 CERTIFIED FINAL-003
Page 506 of 947

Project Number/Contract Number: PN 65555, W912HN-08-C-0001

Standard Design Building Type(s): Large Brigade HQ, Medium Battalion HQ

Our Responsible Party for LEED Documentation for this project is (name, phone number, email).

**Certification:** I, (sender name), certify that the LEED Letter Templates furnished by the Government for this project are copyright protected and I will ensure that they are not used for any purpose other than project documentation for this project only.

Attached Checklist: Please see attached LEED Project Checklist, which indicates the points this project will earn.

Salutation,
Name
***************************************

**COS Points of Contact for Obtaining Letter Templates.** Email your request to the applicable POC indicated below. If there is no POC indicated for the standard design you are providing, contact your project COR for direction.

#### Army Standard Design

Army Family Housing
Battalion Headquarters
Brigade Headquarters
Company Operations Facilities (COF)
Criminal Investigation Facilities
Enlisted Personnel Dining Facilities
General Instruction Buildings/Classroom XXI
Military Entrance Processing Stations
Tactical Equipment Maintenance Facilities (TEMF)
Transient Officer's Quarters (part of ORTC)

#### **Point of Contact**

Lisa.A.Bobotas@usace.army.mil
judith.f.milton@usace.army.mil
judith.f.milton@usace.army.mil
judith.f.milton@usace.army.mil
judith.f.milton@usace.army.mil
Matthew.C.Scanlon@usace.army.mil
David.A.Gary@usace.army.mil
Huong.M.Huynh@usace.army.mil
Lisa.A.Bobotas@usace.army.mil
judith.f.milton@usace.army.mil
paul.m.kai@usace.army.mil

Furnishing Completed Documentation to COS Letter Template Library. Certain completed design phase letter templates with attachments may be requested by the COS for future use as part of the standard design. If requested, provide an electronic copy to the COS Point of Contact indicated above. The Center of Standardization (COS) for individual Army standard designs may maintain a library of completed LEED documentation for that standard design. The Government will make the completed templates available to subsequent standard design projects in order to reduce duplication of documentation effort to the extent possible. To inquire about reviewing or obtaining completed LEED documentation that may be applicable to a particular project, contact the Center of Standardization POC.

#### APPENDIX O LEED Strategy Tables

Section: APPENDIX O

Not Used

#### Section: APPENDIX P

#### APPENDIX P

#### **LEED Registration of Army Projects**

#### 15 April 2010

#### **Number of Registrations**

Each building must be registered separately, except multiple instances of a standard building on a shared site may be registered as a single project. If a single registration for multiple buildings is chosen, all buildings under the single registration must earn exactly the same points. Do not register buildings that are exempt from a specific LEED achievement requirement.

#### **Typical Registration Procedure**

- 1. Login, complete the online registration form (see guidance below) at the GBCI LEED Online website http://www.gbci.org/DisplayPage.aspx?CMSPageID=174 and submit it online.
- 2. Pay the registration fee via credit card (USACE staff: credit card PR&C is funded by project design or S&A funds).
- 3. GBCI will follow up with a final invoice, the LEED-online passwords and template information.
- 4. The individual who registers the project online is, by default, the Project Administrator.

#### **Completing the Registration Form**

#### **BEFORE YOU BEGIN:**

Create a personal account with USGBC if you do not have one.

You will need the following information:

Project name as it appears in P2 (obtain from USACE Project Manager)

Building number/physical address of project

Zip code for Installation/project location

Anticipated construction start and end dates

Total gross area all non-exempt buildings in registration

Total construction cost all non-exempt buildings only (see Project Details Section instructions below)

#### ACCOUNT/LOGIN INFORMATION

- 1. The person registering the project **must have an account with USGBC** (login and password) to complete the form. Go to <a href="http://www.gbci.org/">http://www.gbci.org/</a>, click on "register a project" at the drop-down menu for project certification (at the top of the page) and select "register now for LEED 2009" to start the project registration process. If you have an account, login with your email address and password and select "register new project" to proceed. If you do not have an account, you may select "register a new account" and follow the instructions. It is recommended that you create an account separately on the USGBC website before you start the form. IMPORTANT: USACE team members are members of USGBC and are eligible for Member prices. USACE team members registering projects should be sure to include the USACE Corporate Access ID in their personal account profile (if you do not have it contact <a href="mailto:richard.l.schneider@usace.army.mil">richard.l.schneider@usace.army.mil</a> or <a href="mailto:judith.f.milton@usace.army.mil">judith.f.milton@usace.army.mil</a> for the number).
- 2. The Account/Login Information section is filled out by the person registering the project. It may be a Contractor or a USACE staff member.

#### **ELIGIBILITY SECTION**

Follow directions (accepting the terms and conditions)
Review your profile information and make corrections if needed

#### RATING SYSTEM SELECTION SECTION

Select single project registration and I know which rating system.

Select the rating system - currently only LEED-NC and LEED for Homes are approved for Army use without special approval.

LEED Minimum Program Requirements: select YES

#### Section: APPENDIX P

#### RATING SYSTEM RESULTS SECTION

Confirm selected rating system.

#### PROJECT INFORMATION SECTION

**Project Title:** Begin the project title with a one-word identifier for the Installation. Do not include the word "Fort". After this match the project name used in P2 (contact the USACE Project Manager for this information) and identify the building being registered. Example: "Stewart 4<sup>th</sup> IBCT - DFAC".

**Project Address 1 and 2:** This is the physical location of the project. Provide building number, street address, block number or whatever is known to best describe the location of the project on the Installation.

Project City: Installation Name

State, Country, Zip Code: Self-explanatory

Anticipated Construction Start and End Dates: Self-explanatory – give your best guess if unknown. Note that required data entry format is: 1 or 2 digit month/1 or 2 digit date/4 digit year (example 3/23/2010)

**Gross Square Footage:** Provide total area all buildings in LEED project. Exclude the area of any buildings that are exempt from the LEED achievement requirement (for example, exclude an unconditioned storage shed to be constructed with a barracks complex).

**Is Project Confidential:** Indicate NO except, if project has security sensitivity (elements that are FOUO or higher security), indicate YES.

**Notification of Local Chapter:** Indicate NO unless Government/USACE Project Manager requests you to indicate YES.

Anticipated Project Type: Select the most appropriate option from the drop-down menu.

Anticipated Certification Level: Select the applicable option from the drop-down menu (Silver is the usual level).

#### PROJECT OWNER INFORMATION SECTION

**Project Owner First Name, Last Name, email, phone, address:** The Project Owner is the USACE Project Manager. Obtain this info from the USACE Project Manager.

**Organization:** U.S. Army Corps of Engineers. This field MUST be completed this way because it will be used as a search field by higher HQ to find all USACE registered projects. You may supplement it with district name at the end but DO NOT revise or use an acronym.

May we publish Owner information: Indicate NO

Owner Type: Pick Federal Government from drop-down menu.

**Project Owner Assertion:** Check the box

#### PAYMENT INFORMATION

Self-explanatory

#### Section: APPENDIX Q

#### APPENDIX Q REV 2.1 – 30 SEP 2010 AREA COMPUTATIONS

**Computation of Areas:** Compute the "gross area" and "net area" of facilities (excluding family housing) in accordance with the following subparagraphs:

- (1) Enclosed Spaces: The "gross area" is the sum of all floor spaces with an average clear height ≥6'-11" (as measured to the underside of the structural system) and having perimeter walls which are ≥4'-11". The area is calculated by measuring to the exterior dimensions of surfaces and walls.
- **(2) Half-Scope Spaces:** Areas of the following spaces shall count as one-half scope when calculating "gross area":
  - Balconies
  - Porches
  - Covered exterior loading platforms or facilities
  - Covered but not enclosed spaces, canopies, training, and assembly areas
  - Covered but not enclosed passageways and walks
  - Open stairways (both covered and uncovered)
  - Covered ramps
  - Interior corridors (Unaccompanied Enlisted Personnel Housing Only)
- (3) Excluded Spaces: The following spaces shall be excluded from the "gross area" calculation:
  - Crawl spaces
  - Uncovered exterior loading platforms or facilities
  - Exterior insulation applied to existing buildings
  - Open courtyards
  - Open paved terraces
  - Uncovered ramps
  - Uncovered stoops
  - Utility tunnels and raceways
  - Roof overhangs and soffits measuring less than 3'-0" from the exterior face of the building to the fascia
- **(4) Net Floor Area:** Where required, "net area" is calculated by measuring the inside clear dimensions from the finish surfaces of walls. If required, overall "assignable net area" is determined by subtracting the following spaces from the "gross area":
  - Basements not suited as office, special mechanical, or storage space
  - Elevator shafts and machinery space
  - Exterior walls
  - Interior partitions
  - Mechanical equipment and water supply equipment space
  - Permanent corridors and hallways
  - Stairs and stair towers
  - Janitor closets
  - Electrical equipment space
  - Electronic/communications equipment space

Page 511 of 947

Section: APPENDIX R

RMS SUBMITTAL REGISTER INPUT FORM TYPE OF SUBMITTAL CLASSIFICATION **REVIEWING OFFICE** <----Right click for Instructions PARAGRAPH SECTION DESCRIPTION OF ITEM SUBMITTED NUMBER 00 72 00 52.236-13 Accident Prevention Plan Х X X 1.11 1.11 Dev. From Accept. Design. No Deviation from Contract 00 73 00 Dev. From Accepted Design - Deviates from Contract Χ 00 73 00 Supplemental Price Breakdown 00 73 00 1.18 SSHO Qualifications Х 01 10 00 5.2.3.1 (if concrete pavement) Joint Layout Plan with design 5.5.2 Building Envelope Sealing Performance Testing 01 10 10 Tests as Req by Codes - DOR Develops Test Program Х Х X 5.8.3 01 10 00 BAS Review Information Х X X BAS Performance Verification Test 01 10 00 5.8.3 Х 01 10 00 5.8.4 Testing Adjusting and Balancing Х Х 01 10 00 Х 5.8.5 Commissioning X X X X 01 10 00 Environmental As Required for Site Specific Х 01 10 00 6.16 Permits as required for Site specific 01 10 00 Х 5.10.2 Fire Protection Tests 01 32 01.00 10 3.4.1 Preliminary Project Schedule 01 32 01.00 10 3.4.2 Initial Project Schedule X Х 01 32 01.00 10 3.4.3 Design Package Schedule 01 32 01.00 10 3.6.1 Periodic schedule updates from the Contractor Х X Time Extension Request (Schedule)
Submittal Register - DOR Input Required Χ Х 01 32 01.00 10 3.7 01 33 00 Submittal Register Updates (Design Packages, etc.) Substitution of Manuf or Model Named in Proposal 01 33 00 Χ 01 33 00 1.3.1 Х 1.2 1.1.2 / 3.2.4 Identify Designer(s) of Record 01 33 16 Fast Track Design Package(s) Identification of all Designers of Record 1.2 Х 01 33 16 Х 01 33 16 3.2.1 Site and Utility Des Package, incl. Substantiation Х X X 01 33 16 3.2.2/3.5 Interim Des Subm Package(s), incl. Substantiation Х Х ХХ 01 33 16 3.5.1 Χ X X Drawings Х 01 33 16 3.5.2.2 Sitework Design Analyses Χ Χ ХХ Structural Design Analyses Χ 01 33 16 X X 3.5.2.3 Х 01 33 16 3.5.2.4 Security Design Analyses Х Χ ХХ 01 33 16 3.5.2.5 Architectural Design Analyses Χ Χ ХХ 01 33 16 Mechanical Design Analyses Χ Χ ХХ 3.5.2.6 01 33 16 3.5.2.7 Life Safety Design Analyses Х Х XX 01 33 16 3.5.2.8 Plumbing Design Analyses Х Χ X X 01 33 16 3.5.2.9 Elevator Design Analyses (as Applicable) Χ ХХ Χ X X 01 33 16 3.5.2.10 Electrical Design Analyses Х 01 33 16 3.5.2.11 Telecommunications Design Analyses Χ Χ XX 01 33 16 3.5.2.12 Х Χ X X Cathodic Protection Design Analys Χ Χ ХХ 01 33 16 3.5.3 Geotechnical Investigations and Reports Х 01 33 16 3.5.4 LEED Submittals Х X X 01 33 16 Energy Conservation Documentation Χ Χ X X 3.5.5 01 33 16 3.5.6 Specifications Х Χ X X 01 33 16 3.5.7 Building Rendering Χ Х X X 01 33 16 3.2.4/3.7 Final Des Submittal Package(s), incl. Substantiation XX Х 01 33 16 3.7.5 DD Form 1354 (Transfer of Real Property) X 01 33 16 Independent Technical Review Χ XX 01 33 16 3.2.5/3.8 Design Complete Submittal Package(s) Х XX 01 33 16 3.3.3 Design and Code Review Checklists Χ Х XX 01 33 16 SID - Interim and Final (as applicable) Х 01 33 16 01 33 16 B-2.0 F-3.1.3 FFE (as Applicable) BIM Model and data XX Χ Χ 01 45 04.00 10 3.2 Design and Construction QC Plan Х Х 01 57 20.00.10 1.2 Environmental Protection Plan Х Х 01 78 02.00 10 1.2.1 Final as-Built Drawings/ BIM Model 01 78 02.00 10 1.2.3.11 Non-Hazardous Solid Waste Diversion Reports X Х 01 78 02.00 10 1.2.7 Provide final as-built CADD and BIM Model files Х X X X 01 78 02.00 10 1.2.9 Provide scans of all other docs in Adobe.pdf format 01 78 02.00 10 1.3.1 Equip-in-Place list of all installed equip and cost 01 78 02.00 10 1.3.2 Data on equip not addressed in O&M manuals Х Final as-built specs - electronic files Warranty management plan - FAR 52.246-21 Certificates of Warranty for extended warranty items 01 78 02.00 10 1.3.3 X 01 78 02.00 10 1.4.2.1 01 78 02.00 10 1.4.2.1 01 78 02.00 10 1.4.2.1 Contractor's POCs for implementing warranty process Χ List of each warranted equip, item, feature or system See also Section 01 10 00 par. 5.8.4 and 5.8.5 X 01 78 02.00 10 1.4.2.1 X 01 78 02.00 10 1.5 01 78 02.00 10 1.6.1.2 Х Χ Equipment O&M Manuals - 1 electronic / 2 hard copies Χ 01 78 02.00 10 1.7 Field Training DVD Videos 01 78 02.00 10 1.8 Χ Χ Pricing of CF/CI and GF/CI Property Х Χ 01 78 02.00 10 1.11 Х List of Completed Cleanup Items 01 78 02.00 10 1.12 Х Χ Х Interim Form DD 1354

RMS INPUT FORM 4288A

Export to RMS in CSV(MS-DOS) (\*.csv) Format

Note: Reviewing Office Optional

Section: Appendix AA

Page 512 of 947 This is a CONTROLLED DOCUMENT owned by the Fort Campbell, Environmental Division, Air Quality Program.

#### General Conformity Rule Checklist General Information

Name of Project:	
Construction Company:	
POC Name:	
Phone Number/Email:	
Anticipated Start Date:	Anticipated End Date:
Anticipated Start Date:	Anticipated End Date.

#### **Construction Equipment Listing**

		Hours of		
Equipment Type	Qty	Operation	Miles	Fuel Type
Bulldozer				
Grader				
Excavator				
Backhoe				
Dump Truck				
Fuel/Service Trucks				
Tractors				
Pug Mills (on site)				
Concrete Batch Plant (on site)				
Scraper				
Ready-Mix Truck				
Screed, Concrete				
Portable Paint Sprayer				
Air Compressor				
Lay Down Machines				
Rollers				
Compactors				
Water Trucks				
Pavement Stripping Machines				
Traffic Road Striping				
Loaders				

AQGCRCKLST.0 Page 1 of 2 5 September 2008

Page 513 of 947 This is a CONTROLLED DOCUMENT owned by the Fort Campbell, Environmental Division, Air Quality Program.

Generators		
Compactors		
Curb and Gutter Pavers		
Other:		
Other:		

Emergency Generator Information
(This information will be needed for all stationary emergency generators associated with the project, attach a sheet if necessary)

Manufacturer:
Model Number:
Horsepower:
Max. Fuel consumption (gal/hr):
Fuel Type:
Serial number if currently available:
Stationary Fuel Burning Equipment  (This information will be needed for all stationary sources such as boilers, hot water heaters, etc that will be installed attach a sheet if necessary)
Туре:
Manufacturer:
Model Number:
BTU Value:
Fuel Type:
Serial number if currently available:

#### **Personal Occupancy Vehicle Information**

Vehicle Type	Qty	Miles driven on Post	Fuel Type
Light Duty Truck			
Heavy Duty Truck			
Car/SUV/Van			

Submitted by:	 Date:	

### WMP - Form A - Instructions

Section: Appendix BB

Bidders are required to complete and submit a WMP- Form A. This is the initial job site plan of action and will be used to evaluate project award. It is mandatory for the bidding Contractor to provide all of the following information regarding construction and demolition debris management on the project. This must be completed prior to any material removal from the site.

#### Follow these procedures to maximize recycling at your job site:

1	Separate and recycle wood, cardboard, metal, drywall, and other recyclable materials.	
2	Ensure that all containers and recycling dumpsters are convenient and clearly labeled.	
3	Train new personnel on recycling container location and which materials are recyclable.	
4	Move mixed C&D debris and recycling containers close to each other making it convenient to recycle.	
5	Store materials to prevent loss from damage.	
6	Check recycling and mixed C&D containers daily for mis-sorted materials.	
7	Provide training to people who are mis-sorting recyclable materials.	
8	Identify large quantities of waste that are not being recycled, and have DMC evaluate options for marketing the material.	

#### **Action Items:**

Α	Complete this WMP - Form A and post on-site.	
В	Commit subcontractors to recycle in Subcontractor Agreement.	
С	Keep subcontractors and workers aware of and informed on the C&D Debris Management Program.	
D	Require individuals to properly sort recyclables and hold them responsible for mis-sorted loads.	
Е	Track and promote diversion results.	

Complete the following (3) sheets of the WMP-Form A and submit with proposal.

<sup>\*</sup> Note: Failure to submit <u>WMP- Form A</u> in a timely manner may be cause for Government to render the bid nonresponsive.

## Section: Appendix BB WMP - Form A - Recyclable Materials (Project Name)

Material Type	Condition of Material*	On-site Handling	Hauling Procedures	Final Destination
Asphalt/Concrete (Ex.)	large chunks	stockpile for crushing	haul for on-base use	FTCKY
Asphalt/Concrete				
Brick/Masonry/Tile				
Building Materials **				
Carpet & Pad				
Cardboard				
Ceiling Tile				
Concrete				
Drywall				
Field Office Waste				
Paint				
Plastic Film, Sheeting,				
Scrap Metal				
Aluminum				
Copper				
Steel				
Other Metals				
Unpainted Wood &				
Window Glass				
Soil/gravel				Coordinate w/ Jim Gilkey

<sup>\*</sup> Check with recycler & hauler for any specifications regarding the required condition/s of material (e.g. size restrictions, packaging, other variables.)

Signed:	REQUIRED- SCANNED is OKAY TO USE	Date:	
•	re to submit WMP- Form A in a timely manner may be cause		bid nonresponsive.

<sup>\*\* (</sup>Doors, windows, fixtures, shingles, lumber, insulation, sheetgoods, etc.)

## WMP - Form A - Project Details (Sheet 2)

Section: Appendix BB

Project:		Date:	
1. Estimated Project Waste			_
Total Quantity	Total Cost/Ton	Percentage to be Diverted from Landfill*	
2. Describe methods for avoiding of	ontamination of recyclables		
3. Waste Management Meetings to	be held		
Pre-Construction			
Monthly			
Other		Description: weekly meeting to ensure to put handeling of materials	roper_

\* Must be a minimum of 50% to qualify

Note: Failure to submit WMP- Form A in a timely manner may be cause for Government to render the bid nonresponsive.

#### WMP - Form A - Costings (Sheet 3)

#### 4. Projected Diversion Activities - Construction & Demolition Materials

A	Quantity		D	Е	F	G	
Material Type			Transportation	Handling/ Transport Costs	Projected revenue/tipping fee savings	Total cost or savings	
concrete	5000	stockpile @ Ft. C	20cy truck	=(6+12-12)*B6*60%	=32*B6*60%	=F6-E6	
concrete	5000	stockpile @ Ft. C	20cy truck	\$ 18,000	\$ 96,000	\$ 78,000	
				Cost to crush & transport	Savings by not landfilling	Savings by not landfilling, less cost to crush	
Cost to Perce	of delivered c	oncrete = \$12 rushed stone = \$12 hable concreted = 6	0%				

5. Total net cost (+) or savings (-) from diversion activities \$\_\_\_\_\_

Note: Failure to submit WMP- Form A in a timely manner may be cause for Government to render the bid nonresponsive.

<sup>\* \$12/</sup>ton (Bi-County Landfill's rate for non-hazardous C&D is \$6/cy, mixed C&D debris is approx. 0.5 tons/cy)

#### Section: Appendix BB

#### WMP - Form A - Costings (Sheet 3) (project Name)

#### 4. Projected Diversion Activities - Construction & Demolition Materials

A	В	С	D	E	F	G
Material Type	Quantity Estimate (tons)	Destination	Transportation	Handling/ Transport Costs	Projected revenue/tipping fee savings	Total cost or savings

5. Total net cost (+) or savings (-) from diversion activities \$\_\_\_\_\_

Note: Failure to submit WMP- Form A in a timely manner may be cause for Government to render the bid nonresponsive.

Section: Appendix BB W912QR-23413770 CERTIFIED FINAL-003
Page 519 of 947

Section: Appendix CC W912QR-23413770 CERTIFIED FINAL-003
Page 520 of 947

#### WMP - Form B - Demolition

Quarter #:									Start D	ate:		-				End D	Date:	
																	These include	figures can e revenue
											Cost fo	r Option 1			Cost for Option 2			
A	В	С	D	E	F	G	Н	I	J	K	L	M	N	0	P	Q	R	S
Material	Generate	ed Debris	Recycled I	Debris (%)	Salvage/ Debris			ndfilled oris (%)	Tota	al Diverted Debris		andfill All C&D Debris	Cost to Landfil Mate			age or Reuse (get from costs chart)		Cost of Option One f Option Two)
	Est	Actual	Est	Actual	Est	Actual	Est	Actual	Est (D+F)	Actual (E+G)	Est	Actual	Est	Actual	Est	Actual	Est	Actual
	(tor	ns)	9/	6	%			%		(tons)	\$1	12/Ton	\$	i		\$		\$
									=(B11*D11)						=(6+12-	=(6+12-		
Example: Asphalt/Concrete	130	159	60%	80%	0%	5%	40%			=(C11*E11)+(C11*G11)	=B11*32	=C11*32	=(B11*H11)*32	=(C11*I11)*32		13)*C11*(E11+G11)	=I 11-N11-P11	=M11-O11-O11
Example: Asphalt/Concrete	130	159					40%											\$ 3,140
Example: Metal	55				0%		20%		\$ 44							=(12-70)*C13*(E13+G13)		
Example: Metal	55	69	80%	85%	0%	0%	20%	25%	\$ 44	\$ 59	\$ 1,760	\$ 2,208	\$ 352	\$ 552	\$ (2,552)	\$ (3,402	) \$ 3,960	\$ 5,058
Brick/Masonry/Tile Building Materials*		ļ	ļ	ļ			-				ļ			-		ļ <i>[</i>	ļ	
							<del> </del>	-			-	-				<del>                                     </del>		
Carpet & Pad Cardboard							-	-									1	
			-				+	-								Note this is a negative COS	ST as the	
Ceiling Tile				-			+	<del>                                     </del>		Cost to crush c			5			revenue from the sale of the	he metal	\
Concrete							-	-		Cost to transpo Cost of delivere			<b>}</b>		e	xceeds the cost(\$70/ton>\$1 represents revenue, not		/
Drywall				-				-		Reventue from	sale of met		<i></i>			roproconto rovondo, not	u 555.	
Field Office Waste							+			Cost to landfill :	= \$12/ton		/					
Paint		ļ		<b></b>		ļ	+	+		***************************************			<b></b>		ļ			
Plastic Film, Sheeting, Wrap							-											
Scrap Metal							-					-						
Aluminum							-	-				-						
Copper								-				-						
Steel		-	-				+	-			-	<u> </u>				<u> </u>	-	
Other Metals		-	-			-	+	-			-	-					<b>-</b>	
Unpainted Wood & Pallets		-		-														
Window Glass			1				+				-	-				1		
Other Total			-			-	<del> </del>	-	166.00	193.80	\$5.920.00	\$7,296.00	\$2,016	\$1,824	-2162	-2725.9	5 \$6,066	\$8,198
* Doors, windows, fixtures, shingle Note: Contractor must transfer Diversion percentages ac Attach proof of disposal of	s, lumber, ins WMP Form	sulation, she A estimate nount and t	etgoods, etc. es to Form B type of mate	**\$12/ton (I to demons rials kept ou	Bi-County Lan trate the cun it of the land	nulative am fill to date.	nount o	of waste g			0.5 tons/cy	)						
Contractor Signature:									Date:						Affidavit:			

Section: Appendix CC W912QR-23413770 CERTIFIED FINAL-003
Page 521 of 947

#### WMP - Form B - Demolition

						Ole	ii Date.	March	1 2000					Liiu Dak	e:May	2000	
												r Option 1	c	ost for O	ption 2		
Α	В	С	D	Е	F	G	Н	1	J	K	L	M	N	0	Р	Q	R
-	Generate	ed Debris	Recycled	Debris (%)	Salvage	/ Reuse	Landfille	d Debris	Total D		Cost to L	andfill All	Cost to Land	dfill Non-	Cost to	Recycle,	Total Sav
Material	Est	Actual	Est	Actual	Est	Actual	Est	Actual	Est (D+F)	Actual (E+G)	Est	Actual	Est	Actual	Est	Actual	Est
	(to	ns)		%	9	6	9	<b>%</b>	(to	ns)	\$12	/Ton	\$			\$	
Brick/Masonry/Tile																	
Building Materials*																	
Carpet & Pad																	
Cardboard	0.1																
Ceiling Tile																	
Concrete																	
Drywall																	
Field Office Waste																	
Paint																	
Plastic Film, Sheeting, Wrap																	
Scrap Metal																	
Aluminum																	
Copper																	
Steel																	
Other Metals																	
Unpainted Wood & Pallets	1																
Window Glass																	
Other	21.36				73%	73%	27%	27%									
Total									0.00	0.00	\$0.00	\$0.00	\$0	\$0	0	(	\$0
* Doors, windows, fixtures, Note: Contractor must to Diversion percent Attach proof of dis Contractor Signatur	shingles, lur ransfer WN ages accou sposal or di	mber, insular MP Form A unt for amo version. F	tion, sheetgo estimates unt and typ or example	oods, etc. **\$12 to Form B to cope of materials haul tickets	lemonstrat kept out o , landfill red	e the cumul of the landfill cords, recyc	ative amou to date.	nt of waste	generated a				/cy) 30-Jun-08	Affidav	it:		

Unable to complete form as Habitat for Humanity was unable to weigh materials they salvaged. List of items salvaged is located in folder. Based on form A data and Bicounty landfill tickets approx. 7.57 tons were landfilled. 22 tons diverted. Therefore approx. 73% diverted from landfill.

S ngs (Cost
Actual
3

# TECHNICAL DESIGN GUIDE

#### Instructions for Use

This Document has been prepared jointly by the Fort Campbell Directorate of Public Works and the Louisville District Army Corps of Engineers. Contents of the document are controlled by Public Works. It is updated and housed on the Directorate of Publi Works website. The document contains mandatory criteria, policies, and procedures that apply to all design and construction at Fort Campbell.

To aid the reader, the document utilizes (blue) hyperlink text, which can be accessed by "clicking" the colored text. In addition, the document is formatted using Unified Facilities Guide Specifications (UFGS).

Highlighted text is part of the most recent document update 19 March 2012.

# FORT CAMPBELL, KENTUCKY TECHNICAL DESIGN GUIDE

#### **Table of Contents**

CHAPTER 1	General Information and Administrative Requirements						
CHAPTER 2	General Requirements and Instructions						
CHAPTER 3	Technical Requirements and Instructions						
Division 00 Procurement and Contracting Requirements							
Section 00 22	13Supplementary Instructions to Bidders						
Division 01 General Requirements							
Section 01 50 Section 01 57 Section 01 57	26Government Safety Requirements  00Temporary Construction Facilities and Controls  20.00 10Environmental Protection  23Temporary Storm Water Pollution Control  19Construction and Demolition Waste Management						

#### **Division 02 Existing Conditions**

Section 02 41 00	Demolition and Deconstruction
Section 02 42 91	.Removal and Salvage of Historic Building Materials
Section 02 82 16 20	Engineering Control of Asbestos Containing
Materials	
Section 02 83 13.00 20	Lead in Construction

#### Division 03 Concrete

Section 03 30 00	Cast-in-Place Concrete
Section 03307	Concrete for Minor Structures
Section 03 33 00	Cast-in Place Architectural Concrete

#### **Division 04 Masonry**

Section 04 20 00..... Masonry

#### Division 05 Metals

Section 05 50 13..... Miscellaneous Metal Fabrications

#### Division 06 Wood, Plastics, and Composits

<b>Section 06 20</b>	00Finish Carpentry
Section 06 61	16Solid Polymer (Solid Surfacing) Fabrications

#### Division 07 Thermal and Moisture Protection

Section 07 24 00Exterior Insulation and Finish Systems
Section 07 31 13Asphalt Shingles
Section 07 42 13Metal Wall Panels
Section 07 51 13Built-Up Asphalt Roofing
Section 07 52 00Modified Bituminous Membrane Roofing
Section 07 53 23Ethylene-Propylene-Diene Monomer Roofing (EPDM)
Section 07 61 14.00 20Steel Standing Seam Roofing

#### Division 08 Openings

Section 08 33 23	Overhead Coiling Doors
Section 08 36 13	Sectional Overhead Doors
Section 08 71 00	<u>. Hardware</u>

#### Division 09 Finishes

<b>Section 09 06 9</b>	0 Color Schedule
<b>Section 09 90 0</b>	0Paints and Coatings

#### **Division 10 Specialities**

Section 10 14 01	Exterior Signage
Section 10 14 02	
	Toilet Compartments
Section 10 28 13	

#### **Division 11 Equipment**

Section 11 44 00.....Food Cooking Equipment

#### **Division 13 Special Construction**

Section 13 34 19..... Metal Building Systems

Division 22 Plumbing

Section 22 00 00......Plumbing, General Purpose

#### Division 23 Heating, Ventilating and Air Conditioning

Section 23 00 00......Air Supply, Distribution, Ventilation, and Exhaust Systems

Section 23 08 00.00 10.....Commissioning of HVAC Systems

Section 23 09 23.13 20..... Lonworks Direct Digital Control for HVAC and Other

**Building Control Systems** 

Section 23 09 53.00 20.....Space Temperature Control Systems

Section 23 35 00.00 10.....Overhead Vehicle Tailpipe (and Welding Fume)

**Exhaust Removal Systems** 

Section 23 52 00......Heating Boilers

Section 23 64 10.....Packaged Water Chillers, Vapor Compression Type

Section 23 81 00.00 10......Unitary Air Conditioning Equipment

Section 23 81 23.00 20......Computer Room Air Conditioning Units

Section 23 82 01.00 10......Warm Air Heating Systems

#### **Division 25 Integrated Automation**

Section 25 10 10.....Lonworks Utility Monitoring and Control System

#### **Division 26 Electrical**

Section 26 00 00.00 20.....Basic Electrical Materials and Methods

Section 26 20 00.....Interior Distribution System

Section 26 27 13.10 30.....Electric Meters

Section 26 32 14.00 10.....Diesel-Generator Set, Stationary

Section 26 41 01.00 10.....Lightning Protection System

Section 26 56 00.....Exterior Lighting

#### **Division 27 Communications**

Section 27 10 00.....Building Telecommunications Cabling System

#### **Division 28 Electronic Safety and Security**

Section 28 16 01.00 10....Small Intrusion Detection Systems (IDS)
Section 28 31 76.....Interior Fire Alarm System and Mass Notification
System

#### **Division 31 Earthwork**

Section 31 23 00.00 20.....Excavation and Fill Section 31 31 16......Soil Treatment for Subterranean Termite Control

#### **Division 32 Exterior Improvements**

Section 32 93 00.....Exterior Plants

#### **Division 33 Utilities**

Section 33 11 00Water Distribution
Section 33 30 00Sanitary Sewers
Section 33 40 00Storm Drainage Utilities
Section 33 51 15Natural Gas/Liquid Petroleum Gas Distribution
Section 33 56 10Factory Fabricated Fuel Storage Tanks
Section 33 61 00Prefabricated Underground Heating/Cooling
<u>Distribution System</u>
Section 33 70 02.00 10Electrical Distribution System, Underground
Section 33 71 01Overhead Transmission and Distribution
Section 33 82 00Telecommunications Outside Plant (OSP)

## Division 43 Process Gas and Liquid Handling, Purification, and Storage Equipment

<u>Section 43 15 00.00 20....Low Pressure Compressed Air Piping (Non-Breathing Air Type)</u>

#### **APPENDIX A Environmental Topics**

**Appendix A-1** Occupational Health Considerations

Appendix A-2 Clean Air Act

Appendix A-3 Clean Water Act

Appendix A-4 Safe Drinking Water Act

Appendix A-5 Toxic Substances Control Act (TSCA)

Appendix A-6 Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)

Appendix A-7 Solid Waste Disposal Act

Appendix A-8 Hazardous Waste Disposal Act

## Appendix A-9 Emergency Planning and Community Right-To-Know Act Appendix A-10 National Emission Standards for Hazardous Air Pollutants (NESHAP)

APPENDIX B
APPENDIX C
Digging/Excavation Permits

APPENDIX D
Building Interior and Exterior Finishes
Fort Campbell Landscape Plant List
Utility Procedures
APPENDIX F
APPENDIX G
Mold and Humidity Control
APPENDIX H
Network Enterprise Center, Fort Campbell Requirements
APPENDIX I
Erosion and Sedimentation Control
Installation of ICIDS Equipment in Arms Rooms

**APPENDIX K** Refuse Container Enclosures

# Technical Design Guide CHAPTER 1

## General Information and Administrative Requirements

#### **PARAGRAPH**

Section: Appendix DD

- 1-1 Purpose
- 1-2 **Document Format**
- 1-3 Application
- 1-4 Design Submittals
- 1-5 **Improvements and Deviations**

#### 1-1 Purpose

- 1-1.2 Prior to the development of this Technical Design Guide, the source for Ft. Campbell specific Engineering and design guidance was contained in the "Fort Campbell Installation Design Guide (IDG)" and the "Louisville District Architect-Engineer Design Guide (AEDG) for Military Construction." The "Fort Campbell, Kentucky, Technical Design Guide" has been developed to provide a single-source comprehensive resource for technical requirements regarding all MILCON and OMA program projects located on post. The technical guidance and criteria in this document is considered specific to Fort Campbell and it applies to all engineering and construction efforts completed by the Directorate of Public Works (DPW), The US Army Corps of Engineers (COE), and all Contract A-E designers.
- 1-1.2 The "Fort Campbell, Kentucky, Technical Design Guide" is the result of ongoing joint efforts between Fort Campbell and Louisville District. The document is the property of the Fort Campbell, Directorate of Public Works. It is maintained by the Directorate of Public Works and is made available at the following website:

  (http://www.campbell.army.mil/campbell/directorates/DPW/Documents/Docs/FTC\_Tech\_Design\_Guide.pdf). A joint DPW and COE committee oversees maintenance, evaluation, and revision of the technical contents. Specific guidance and criteria contained within are developed through specialized sub-committees with representatives from engineering, construction, and maintenance personnel from Ft. Campbell and Louisville COE. It is intended by the committee that the document continuously grows to accept additional information, accept changes in technology, and reflect changes in Army guidance, policies and visions.
- 1-1.3. The Fort Campbell DPW vision includes the need for consistent design and construction of environmentally sound, energy efficient, easily maintainable facilities. This technical document is part of an ongoing commitment to bring that vision into reality at Ft. Campbell.

#### **1-2** Document Format

- 1-2.1. The technical content of this document uses Unified Facilities Guide Specs (UFGS) format.
- 1-2.2. <u>Fort Campbell Requirements</u> are considered mandatory. Requirements shall be reflected on construction contract documents and support data.
- 1-2.3. <u>Instructions to Designers</u> provide technical directions and describe where Fort Campbell Requirements shall be stated in contract and supporting documents.

#### 1-3 Application

- 1-3.1 Contents of this document shall apply to design and construction effort for all MCA funded and OMA funded projects completed by the DPW and/or the Louisville District COE. It applies to both in-house staff and to contracted designers.
- 1-3.2 This document shall be used in collaboration design and Urgan Design requirements described in companion document: ACSIM, <u>Army Installation Design Standards</u>, also available on the Internet.

#### 1-4 Design Submittals

- 1-4.1 All MILCON funded project designs shall follow design and submittal procedures outlined in the Project Management Plan (PMP) together with the A-E Scope of Services, or the in-house Quality Control Plan/Contract.
- 1-4.2 All OMA funded project designs shall follow design and submittal procedures identified in the designer prepared "Statement of Work" or "Performance Work Statement".
- 1-4.3 It is the responsibility of the Designers of Record to insure technical contents of this document are incorporated into design documents prior to submission for review.

#### 1-5 Document Improvements and Deviations

1-5.1 This to be a "Living Document." Recommended changes, additions and requests for deviation are invited from anyone who uses it. Recommended changes, additions, additional guidance topics and requests to deviate from the guidance are accepted at any time. Recommendations can be offered electronically or in paper form or by verbal request. To assist those reviewing recommendations, a sample form containing the needed information is available in <a href="Figure 1">Figure 1</a>. Completed forms shall be provided to the DPW or Louisville COE Committee Member identified below:

Sally P. Castleman Phone (270) 798-7319

Email: sally.p.castleman@us.army.mil

#### **Return to Table of Contents**

# Chapter 1 Figure 1: Recommended Document Change

Please Indicate the Type of Proposed Change:
Modification New Topic
Please Indicate the Recommended Priority:
Routine Urgent
Please Explain the Proposed Change:
Please identify any guidance, criteria, or reasons causing the proposed change:
Please Provide the Point of Contact who generated this proposal:
Name:
Phone:
Email:

Return to Chapter 1 para 1-5

## TECHNICAL DESIGN GUIDE CHAPTER 2 General Requirements

W912QR-23413770 CERTIFIED FINAL-003 Page 532 of 947

#### **PARAGRAPH**

#### 2.0 General Design Provisions

**General Design Criteria** 

**Deliverables** 

**Antiterrorism / Force Protection** 

Fire Protection/Life Safety

**Metric Design** 

**Surveying and Mapping Requirements** 

**Geotechnical Requirements** 

**Cost Engineering** 

**Engineering Instructions for Field Personnel** 

**Transfer and Acceptance** 

#### 2.1 Special Ft. Campbell Criteria

**Energy Program** 

**Historic District** 

**Environmental** 

**Underground and Aboveground Storage Tanks** 

**Solid Waste Disposal / Recycling Diversion Practices** 

**Erosion and Sedimentation Control** 

**Permits** 

Fort Campbell DPW Computer Software Capabilities

**Installation Internet Addresses** 

**Return to Table of Contents** 

#### 2.0 General Design Criteria

**MILCON Projects** 

For new construction in the MILCON program, design effort will be completed in accordance with the approved Project Management Plan (PMP), design contract scope of services, and identified criteria. The ACSIM, <u>Army Installation Design Standards</u>, together with this document shall both apply to engineering and construction actions.

#### **OMA Projects**

For Operations and Maintenance projects, design effort will be completed in accordance with the DPW contract scope of services. Scope of design services shall be based upon the <u>designer</u> prepared project specific <u>Scope Definition Document</u> that is completed after a pre-design conference and site evaluation.

#### Electrical Criteria, Codes, Regulations to be incorporated in project designs are as follows:

- ASHRAE 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings
- EPACT 2005 Energy Policy Act of 2005, Public Law 109-58.
- IBC International Building Code
- IEEE C2 National Electrical Safety Code
- IESNA Illuminating Engineering Society of North America
- MIL HDBK 1190 Military Handbook for Facility Planning and Design Guide
- MIL HDBK 1191 Military Handbook for Medical and Dental Treatment Facilities, Design and Construction Criteria Guide
- National Electrical Contractors Association (NECA)
- National Electrical Installation Standards (NEIS)
- NFPA 70 National Electric Code
- NFPA 72 National Fire Alarm and Signaling Code
- NFPA 101 Life Safety Code
- TI 800-01 Design Criteria
- TI 800-03 Technical Requirements for Design-Build
- TM 5-811-3 Electrical Design: Lightning and Static Electricity Protection

#### **Unified Facilities Criteria - UFC**

- UFC 1-200-01 Design: General Building Requirements
- UFC 3-501-01 Electrical Engineering

- UFC 3-510-01 Foreign Voltages and Frequencies Guide
- UFC 3-520-01 Interior Electrical Systems
- UFC 3-520-05 Stationary Battery Areas
- UFC 3-530-01 Design: Interior and Exterior Lighting and Controls
- UFC 3-535-01 Visual Air Navigation Facilities
- UFC 3-540-04N Diesel Electric Generating Plants
- UFC 3-550-01 Exterior Electrical Power Distribution
- UFC 3-555-01N 400 Hertz Medium Voltage Conversion/Distribution and Low Voltage Utilization Systems
- UFC 3-560-01 Electrical Safety, O&M
- UFC 3-570-02A Cathodic Protection
- UFC 3-570-02N Electrical Engineering Cathodic Protection
- UFC 3-570-06 O&M: Cathodic Protection Systems
- UFC 3-580-01 Telecommunications Building Cabling Systems Planning and Design
- UFC 3-600-01 Fire Protection Engineering for Facilities
- UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings
- UFC 4-020-04A Electronic Security Systems: Security Engineering
- UFC 4-021-01 Design and O&M: Mass Notification Systems
- UFC 4-021-02NF Security Engineering Electronic Security Systems
- UFC 4-030-01 Sustainable Development
- Tri-Service Electrical Working Group (TSEWG)
- UNIFIED FACILITIES GUIDE SPECIFICATIONS DIVISION 26 ELECTRICAL
- UNIFIED FACILITIES GUIDE SPECIFICATIONS DIVISION 33 UTILITIES.

#### UNIFIED FACILITIES GUIDE SPECIFICATIONS - DIVISION 26 - ELECTRICAL and DIVISION 33 - UTILITIES.

- 26 00 00.00 20 07/06 BASIC ELECTRICAL MATERIALS AND METHODS
- 26 05 00.00 40 11/10 COMMON WORK RESULTS FOR ELECTRICAL
- 26 05 13.00 40 08/10 MEDIUM-VOLTAGE CABLES
- 26 05 19.00 10 11/08 INSULATED WIRE AND CABLE

- 26 05 33 01/07 DOCKSIDE POWER CONNECTION STATIONS
- 26 05 48.00 10 10/07 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT
- 26 05 70.00 40 02/11 HIGH VOLTAGE OVERCURRENT PROTECTIVE DEVICES
- 26 05 71.00 40 02/11 LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES
- 26 08 00 08/08 APPARATUS INSPECTION AND TESTING
- 26 09 13 11/08 POWER MONITORING SYSTEM
- 26 09 23.00 40 08/10 LIGHTING CONTROL DEVICES
- 26 11 13.00 20 04/07 PRIMARY UNIT SUBSTATION
- 26 11 14.00 10 10/07 MAIN ELECTRIC SUPPLY STATION AND SUBSTATION
- 26 11 16 02/10 SECONDARY UNIT SUBSTATIONS
- 26 12 19.00 40 02/11 PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS
- 26 12 19.10 11/09 THREE-PHASE PAD-MOUNTED TRANSFORMERS
- 26 12 19.20 04/06 SINGLE-PHASE PAD-MOUNTED TRANSFORMERS
- 26 13 00.00 20 04/06 SF6 INSULATED PAD-MOUNTED SWITCHGEAR
- 26 18 23.00 40 08/10 MEDIUM-VOLTAGE SURGE ARRESTERS
- 26 20 00 08/08 INTERIOR DISTRIBUTION SYSTEM
- 26 22 00.00 10 10/07 480-VOLT STATION SERVICE SWITCHGEAR AND TRANSFORMERS
- 26 23 00.00 40 02/11 SWITCHBOARDS AND SWITCHGEAR

- 26 23 00 07/06 SWITCHBOARDS AND SWITCHGEAR
- 26 24 16.00 40 08/10 PANELBOARDS
- 26 24 19.00 40 08/10 MOTOR CONTROL CENTERS
- 26 27 13.10 30 10/07 ELECTRIC METERS
- 26 27 14.00 20 02/11 ELECTRICITY METERING
- 26 27 29 04/06 MARINA ELECTRICAL WORK
- 26 28 00.00 10 10/07 MOTOR CONTROL CENTERS, SWITCHBOARDS AND PANELBOARDS
- 26 28 01.00 10 10/07 COORDINATED POWER SYSTEM PROTECTION
- 26 28 21.00 40 08/10 AUTOMATIC TRANSFER SWITCHES
- 26 29 01.00 10 11/08 ELECTRIC MOTORS, 3-PHASE VERTICAL INDUCTION TYPE
- 26 29 02.00 10 11/08 ELECTRIC MOTORS, 3-PHASE VERTICAL SYNCHRONOUS TYPE
- 26 29 23 04/06 VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS
- 26 32 13.00 20 04/07 SINGLE OPERATION GENERATOR SETS
- 26 32 14.00 10 02/10 DIESEL-GENERATOR SET, STATIONARY 15-300 KW, STANDBY APPLICATIONS
- 26 32 15.00 10 10/07 DIESEL-GENERATOR SET STATIONARY 100-2500 KW, WITH AUXILIARIES
- 26 32 26 04/06 MOTOR-GENERATOR SETS, 400 HERTZ (HZ)
- 26 32 33.00 10 10/07 UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM ABOVE 15 KVA CAPACITY
- 26 33 53.00 20 04/08 UNINTERRUPTIBLE POWER SUPPLY (UPS)

- 26 35 33.00 40 08/10 POWER FACTOR CORRECTION EQUIPMENT
- 26 35 43 04/06 400-HERTZ (HZ) SOLID STATE FREQUENCY CONVERTER
- 26 35 46.00 20 04/06 RADIO FREQUENCY INTERFERENCE POWER LINE FILTERS
- 26 36 00.00 10 10/07 AUTOMATIC TRANSFER SWITCH AND BY-PASS/ISOLATION SWITCH
- 26 36 23.00 20 04/06 AUTOMATIC TRANSFER SWITCHES
- 26 41 00.00 20 04/06 LIGHTNING PROTECTION SYSTEM
- 26 41 00.00 40 11/08 LIGHTNING PROTECTION SYSTEM
- 26 41 01.00 10 11/08 LIGHTNING PROTECTION SYSTEM
- 26 42 13.00 20 04/06 CATHODIC PROTECTION BY GALVANIC ANODES
- 26 42 14.00 10 08/09 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)
- 26 42 15.00 10 11/08 CATHODIC PROTECTION SYSTEM (STEEL WATER TANKS)
- 26 42 17.00 10 11/08 CATHODIC PROTECTION SYSTEM (IMPRESSED CURRENT)
- 26 42 19.00 20 04/06 CATHODIC PROTECTION BY IMPRESSED CURRENT
- 26 42 19.10 11/08 CATHODIC PROTECTION SYSTEMS (IMPRESSED CURRENT)FOR LOCK MITER GATES
- 26 42 22.00 20 01/08 CATHODIC PROTECTION SYSTEM FOR STEEL WATER TANKS
- 26 51 00.00 40 02/11 INTERIOR LIGHTING
- 26 51 00 07/07 INTERIOR LIGHTING
- 26 52 00.00 40 11/08 EMERGENCY LIGHTING

- 26 53 00.00 40 11/08 EXIT SIGNS
- 26 54 21.00 10 10/07 HELIPAD LIGHTING AND VISUAL NAVIGATION AIDS
- 26 55 53.00 10 10/07 EXTERIOR LIGHTING INCLUDING SECURITY AND CCTV APPLICATIONS
- 26 55 53.00 40 11/08 SECURITY LIGHTING
- 26 55 80.00 20 04/06 SURGICAL LIGHTING FIXTURES
- 26 56 00 07/06 EXTERIOR LIGHTING
- 26 56 13.00 40 11/08 LIGHTING POLES AND STANDARDS
- 26 56 19.00 40 11/08 ROADWAY LIGHTING
- 26 56 20.00 10 10/07 AIRFIELD AND HELIPORT LIGHTING AND VISUAL NAVIGATION AIDS
- 26 56 23.00 40 11/08 AREA LIGHTING
- 26 56 36.00 40 11/08 FLOOD LIGHTING
- 26 60 13.00 40 08/08 LOW-VOLTAGE MOTORS

#### **DIVISION 33 – UTILITIES**

- 33 70 02.00 10 11/08 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND
- 33 71 01.00 40 11/08 OVERHEAD TRANSMISSION AND DISTRIBUTION
- 33 71 01 07/06 OVERHEAD TRANSMISSION AND DISTRIBUTION
- 33 71 02.00 20 08/08 UNDERGROUND ELECTRICAL DISTRIBUTION
- 33 73 00.00 40 11/08 UTILITY TRANSFORMERS

#### 33 75 00.00 40 11/08 SWITCHGEAR AND PROTECTION DEVICES

33 77 19.00 40 08/10 MEDIUM-VOLTAGE GAS SWITCH

33 77 36.00 40 05/10 MEDIUM-VOLTAGE UTILITY FUSES

33 81 27 04/06 PIER TELEPHONE DISTRIBUTION SYSTEMS

# UNITED STATES DEPARTMENT OF AGRICULTURE, Rural Development Utilities Programs, BULLETINS and Associated Documents:

- USDA Rural Utility Service (RUS)
- RUS 1728F-310 Drawing Index 35.5 to 69 kV
- RUS 1728F-804 Drawing Index 12.5 & 7.2 kV
- RUS 1724D-101B System Planning Guide
- RUS 1724D-104 Econ Worksheet
- RUS 1724E-152 OH Dist. Line Conductors Mechanics
- RUS 1724E-153 Guys and Anchors
- RUS 1724E-154 Distribution Conductor Clearances and Span Limitations
- RUS 1724E-200 Design Manual HV Transmission Lines
- RUS 1724E-203 Upgrading RUS Transmission Lines
- RUS 1724E-204 Specs Steel Pole H Frame
- RUS 1724E-205 Embedment Depths
- RUS 1724E-214 Guide Specifications For Standard Class Steel Transmission Poles
- RUS 1724E-300 Rural Sub Station Design
- RUS 1724E-224 Specifications and Drawings for Steel Poles
- RUS 1728F-804 Specifications and Drawings for 12.47/7.2 kV Line Construction
- RUS 1728F-806 Specifications for Underground Distribution
- RUS 1728F-810 Specifications and Drawings for 34.5 to 69 kV
- RUS 1730B-121 Pole Inspection and Maintenance
- RUS 1751F-650 Aerial Plant Guying and Anchoring
- UEP-steel poles Guidelines for the Use Steel Distribution Poles

# NECA 100-2006 Electrical Symbols Set © 2006, NECA

NECA 100-2006 Symbols for Electrical Construction Drawings (ANSI) © 2006, NECA

NECA 101-2006 Standard for Installing Steel Conduit (Rigid, IMC, EMT) (ANSI) © 2006, NECA

NECA 102-2004 Standard for Installing Aluminum Rigid Metal Conduit (ANSI) © 2004, NEIS

NECA 111-2003 Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) (ANSI) © 2003, NECA

NECA 1-2010 Standard Practice of Good Workmanship in Electrical Construction (ANSI) © 2010, NECA

NECA 120-2006 Standard for Installing Armored Cable (Type AC) and Metal-Clad Cable (Type MC) (ANSI) © 2006, NECA

NECA 121-2007 Standard for Installing Nonmetallic-Sheathed Cable (Type NM) and Underground Feeder and Branch-Circuit Cable (Type UF) (ANSI) © 2007, NECA

NECA 130-2010 Standard for Installing and Maintaining Wiring Devices © 2010, NECA

NECA 169 Standard for Installing and Maintaining Arc-Fault Circuit Interrupters © 2010, NECA

NECA 200-2010 Recommended Practice for Installing and Maintaining Temporary Electric Power at Construction Sites (ANSI) © 2010, NECA

NECA 202-2006 Standard for Installing and Maintaining Industrial Heat Tracing Systems (ANSI) © 2006, NECA

NECA 230-2010 Standard for Selecting, Installing, and Maintaining Electric Motors and Motor Controllers (ANSI) © 2010, NEIS

NECA 303-2005 Standard for Installing Closed-Circuit Television Systems (CCTV) (ANSI) © 2005, NECA

NECA 305-2010 Standard for Fire Alarm System Job Practices (ANSI) © 2010, NECA

NECA 331-2009 Standard for Building and Service Entrance Grounding and Bonding (ANSI) © 2009, NECA

NECA 400-2007 Standard for Installing and Maintaining Switchboards (ANSI) © 2007, NECA

NECA 402-2007 Standard for Installing and Maintaining Motor Control Centers (ANSI) © 2007, NECA

NECA 406-2003 Standard for Installing Residential Generator Sets (ANSI) © 2003, NECA

NECA 407-2009 Recommended Practice for Installing and Maintaining Panelboards (ANSI) © 2009. NECA

NECA 408-2009 Standard for Installing and Maintaining Busways (ANSI) © 2009, NECA

NECA 409 – 2009 Standard for Installing and Maintaining Dry-Type Transformers (ANSI) © 2009, NECA

NECA 410-2005 Standard for Installing and Maintaining Liquid-Filled Transformers (ANSI) © 2005

NECA 411-2006 Standard for Installing and Maintaining Uninterruptible Power Supplies (UPS) (ANSI) © 2006

NECA 420-2007 Standard for Fuse Applications (ANSI) © 2007, NECA

NECA 430-2006 Standard for Installing Medium-Voltage Metal-Clad Switchgear (ANSI) © 2006, NEIS

NECA 503-2005 Standard for Installing Fiber Optic Lighting Systems © 2005, NECA

NECA 505 Standard for Installing and Maintaining High Mast, Roadway and Area Lighting © 2010, NECA

NECA 700-2010 Standard for Installing Overcurrent Protection to Achieve Selective Coordination © 2010, NECA

NECA 90 Recommended Practice for Commissioning Building Electrical Systems (ANSI) © 2009, NECA

NECA Guide to Installing Communications Systems © 2002, NECA, Index No. 5200

Type: Set

NECA/AA 104-2006 Standard for Installing Aluminum Building Wire and Cable (ANSI) © 2006, NEIS

NECA/BICSI 568-2006 Standard for Installing Building Telecommunications Cabling (ANSI) © 2006, NECA

NECA/BICSI 607-2011 Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings © 2011, NECA/BICSI

NECA/EGSA 404-2007 Standard for Installing Generator Sets (ANSI) © 2007, NECA

NECA/FOA 301-2009 Standard for Installing and Testing Fiber Optics (ANSI) © 2009, NEIS

NECA/IESNA 500-2006 Standard for Installing Indoor Lighting Systems (ANSI) © 2006, NECA,

NECA/IESNA 501-2006 Standard for Installing Exterior Lighting Systems (ANSI) © 2006, NEIS

NECA/IESNA 502-2006 Standard for Installing Industrial Lighting Sytems (ANSI) © 2006, NECA

NECA/MACSCB 600-2003 Recommended Practice for Installing and Maintaining Medium-Voltage Cable (ANSI) © 2003, NECA

NECA/NEMA 105-2007 Standard for Installing Metal Cable Tray Systems (ANSI) © 2007, NECA

NECA/NEMA 605-2005 Recommended Practice for Installing Underground Nonmetallic Utility uct (ANSI) © 2005, NECA

**Electrical Design Checklist** 

#### A. Check the power riser diagram.

#### 1. Main transformer

- a. Insure the primary and secondary voltages/connections are shown.
- b. Insure impedance(s) are shown or covered in the specifications.

# 2. Primary

- a. Insure the size and voltage ratings of the cable are shown.
- b. Insure the size is adequate for the transformer size.
- c. Insure fused cutouts or fused primary switch is shown.

#### 3. Service

- a. Insure the service entrance conductors are sized for the demand or the transformer secondary current as a maximum
- b. Insure the grounding electrode conductor is in accordance with NEC Article 250.

# 4. Service Equipment

- a. Insure the main breaker and interrupting ratings are shown:
  - i. verify the continuous current rating with demand load calculations.
  - ii. verify interrupting rating(s) with short circuit calculations
- b. Insure the main bus rating is shown (size should agree with the demand load calculations as a minimum.

- c. Insure Ground Fault Protection is shown if required by the National Electrical Code. See also additional requirements from UFC 3-520-01.
- d. Insure the 15%-25% spare breakers are shown.

# 5. Subpanels

- a. Insure feeders are sized per the demand load calculations (as a minimum; can be sized to match the rating of the panel).
- b. Insure the panel main breaker (if not MLO) is sized for the panel rating. Insure the interrupting rating is shown and verified by short circuit calculations.
- c. Insure the panel trim (flush vs. surface) is shown.
- d. Insure an oversized neutral is shown when required for nonlinear loads (ETL 1110-3-403).
- e. Insure the 15%-25% spare breakers are shown.

#### 6. 208/120 Volt Panels

- f. Insure the required main breaker is shown.
- g. Check to insure it is sized at the demand load as a minimum or the panel rating as a maximum.
- h. Insure the interrupting rating is shown and verified by short circuit calculations.
- i. Insure an oversized neutral is shown when required for nonlinear loads (ETL 1110-3-403).
- j. Insure the 15%-25% spare breakers are shown.

# 7. 480/277 Volt dry type transformers

- k. Insure transformers are sized by demand load calculations
- I. Insure the grounding electrode conductor is in accordance with NEC Article 250.
- m. Insure the primary and secondary connections are shown.

#### **B. Floor Plans**

- 1. Compare the electrical plans (lighting, power and systems) with the architectural to insure these agree.
- 2. Compare these plans with the mechanical plans to insure the power is provided to mechanical equipment and it's the correct size as shown in the mechanical equipment schedule.

# C. Lighting Plans

- 1. Coordinate the lighting fixture layout with the HVAC plans to insure fixtures and registers do not conflict in locations.
- 2. Insure lighting switches are shown on the correct side of the door swing and that they are not located in sidelights or other glass.
- 3. Insure a fixture schedule is included. Use the new 40-06-06 for details and El 16E500 for the schedule.
- 4. Insure fixtures chosen are compatible with ceiling types specified on the architectural plans.
- 5. Insure boundaries of any hazardous classified location and identification of this location(s) are shown clearly.
- 6. If dimming ballasts are required, insure they are shown in the details and/or schedule.

#### D. Power Plans

- 1. Insure there is power to each piece of HVAC equipment (size for sizes shown in mechanical equipment schedules).
- 2. Insure Ground Fault Protection is shown if required by the National Electrical Code. See also additional requirements from UFC 3-520-01.
- 3. Insure the chiller circuit(s) is sized in accordance with the manufacturer's data and that the data is included in the design analysis.
- 4. Insure receptacles are located at the TBB, LAN backboard and DDC controls.
- 5. Insure there is at least one outlet on every wall.
- 6. Panel Schedules
  - a. Panel name
  - b. MLO or Main Breaker
  - c. AIC rating shown
  - d. Size of branch breaker and description shown
  - e. Oversize neutral shown where required
  - f. Surface or flush trim shown
  - g. Voltage rating and main bus rating is shown
  - h. Spare breakers shown
  - i. Insure standard sizes are shown (≤100 Amps use 30 poles; ≤225 Amps use 42 poles)
  - j. Indicate any 2 section panels (state if they are feed-through or double lugs).
- 7. Insure boundaries of any hazardous classified location and identification of this location(s) are shown clearly.

# E. Fire Alarm Plans

- 1. Initiating Devices
- 2. Manual pull stations
  - a. Every egress
  - b. Every level
  - c. 200 foot maximum travel distance
- 3. Area detection
  - a. Protect all areas including area above ceiling if needed.
  - b. Place all detection devices at least 12-18 inches from lights and 3 feet from HVAC registers.
- 4. Heat detectors
  - a. Reduce spacing for ceilings above 10 feet.
  - b. Reduce spacing for other than smooth ceilings (joist, beam, etc.)
  - c. All points on ceiling shall be within .7 of the listed spacing after adjustments are made.
- 5. Smoke detectors
  - a. Use 30 feet spacing as a guide
  - b. Adjust spacing for other than smooth ceilings (joist, beam, etc.)

- c. All points on the ceiling shall be within .7 of the listed spacing after adjustments are made.
- d. Consider the effects of stratification.

# 6. Special Applications

- a. Use smoke detectors under raised floors and above ceilings if this area is a return air plenum. Use detectors rated for the air velocity present.
- b. See NFPA 72-5.7.5.2 for high rack storage areas.
- c. See NFPA 72-5.7.5.3 for areas of high air movement.
- d. See NFPA 72-6.15.3 for elevator recall.
- e. See NFPA 72-6.15.5.2 for smoke door release.

#### 7. Duct detectors

- a. Coordinate with the mechanical engineer.
- b. Over 2000 CFM, provide on supply.
- c. Over 15000 CFM and multistory building, provide on return.
- d. Provide remote test station as required by NFPA 72.
- e. Show detectors on floor plans and in the rise.

# 8. Notification Appliances

- a. Audible Appliances
  - i. Locate to provide sufficient sound level
    - 1. 15 dB above ambient
    - 2. 5 dB above maximum 60 second sound level
    - 3. Double the distance loses 6 dBA
    - 4. Lose 25 dB through walls
    - 5. Lose 10 dB through doors
    - 6. UFGS states that bells/horns have 85 dBA at 10 feet
    - 7. Provide devices on every floor
    - 8. Provide devices in noisy areas (e.g. mechanical rooms, etc).
    - 9. Devices shall have a temporal sound pattern in accordance with NFPA 72.
- b. Visual Appliances

Space in accordance with NFPA 72 and ADAAG.

#### 9. Control Panel

- a. Where connecting to an existing system, insure that the existing and new systems are compatible.
- b. For conventional systems, use the following zones:
  - i. Fire suppression system
  - ii. Hazardous areas
  - iii. Flow switches
  - iv. Tamper switches
  - v. Other supervisory devices
  - vi. Fireman's elevator service

- vii. Attic detectors
- viii. Pull station
- ix. Kitchen equipment
- x. Notification appliances
- xi. Automatic door release
- xii. Power shutdown to data processing equipment
- xiii. AHU shutdown
- c. Provide manual override for AHU shutdown testing.
- d. NFPA 72 lists maximum number of devices for a zone.
- e. Annunciator: use a graphic annunciator if one is required.
- f. Specify transceiver to be compatible with the base/post system.
- g. Riser Diagram
  - i. Show FACP
  - ii. Show power supply
  - iii. Show signaling method
  - iv. Show annunciator
  - v. Show all zones

# h. Power Supply

- i. Provide primary source from light and power system (208/120 volts) per NFPA 72.
- ii. Secondary source is primary batteries. Size per NFPA 72 requirements. Provide a separate battery cabinet.
- iii. Power all devices from the FACP.

#### i. Wiring

- i. All wiring is to be Class A, Style D.
- ii. When connecting to an existing system, insure compatibility. Do not connect a 4-wire system to a 2-wire system.
- j. Sprinkler System Supervision
  - i. Coordinate with the Mechanical/Fire Protection engineer.
  - ii. Flow switches
  - iii. Tamper switches
  - iv. Pressure switches (on all systems).

# F. Telephone

- 1. Verify receptacles are located at the TBB.
- 2. Verify telephone outlets are located as desired by the user.
- 3. Provide telephone outlets at the DDC panel location.
- 4. Verify the telephone room complies with EIA/TIA standards.
- 5. Insure CAT 5 circuits have not exceeded the 90-meter limit in length.

# **G. Mass Notification System**

- 1. Insure audible and visual devices are shown
- 2. Insure the system is shown interconnected with the FACP
- 3. Determine what the Mass Notification message are to be

#### H. Site Plan

- 1. Verify the electrical site plan agrees with the civil site plan
- 2. Coordinate with the landscaping plans to avoid conflicts between electrical equipment (transformers, lighting fixtures, etc.) and planting materials.
- 3. Coordinate with the mechanical plans to avoid conflicts in location between transformers and chillers, etc.
- 4. Verify the lighting layout meets design lighting levels prescribed in the IES and the TI; support with calculations.
- 5. Verify required details are show; these include pole details, pad details, manhole/handhole details, duct bank sections, etc.
- 6. Coordinate with other utilities (water, sewer, gas, storm sewer, etc.) to identify any conflicts and to insure that required code (IEEE C2 and NFPA 70) clearances are obtained.
- 7. Verify that manholes/handholes have been located in accordance with pulling calculations.
- 8. Verify that overhead line clearances meet IEEE C2 (verified with sag calculations where required).
- 9. Verified that guy leads and guy sizes are shown and supported by calculations.
- 10. Verify that cathodic protection is provided where required, that all appropriate details are shown and that the current specifications have been used.
- 11. Insure all circuits that are intended to remain and to be reconnected with new circuits are properly shown and all necessary work is identified.

#### I. Miscellaneous Drawings

- 1. Verify all symbols are included in the legend (use Tri-Service standard symbols).
- 2. Verify enlarged plans of electrical and/or mechanical rooms are included if necessary.
- 3. Insure the size of large items of equipment can be provided by at least three manufacturers.

#### J. Miscellaneous

- 1. Insure Customer Specifics Criteria has been incorporated.
- 2. Insure all design techniques for nonlinear loads have been incorporated.

# L. Design Analysis

- 1. Calculations included
  - a. Demand load analysis
  - b. Lighting Calculations
    - i. Zonal cavity for interior
    - ii. Exterior
  - c. Short circuit calculations

# d. Voltage drop calculations

- 2. Coordination study provided (as required in the design manual).
- 3. Arc Flash Hazard Analysis has been performed and results presented.
- 4. Design narrative
- 5. Interior, exterior narratives
- 6. Catalog cuts

#### M. Lessons Learned

- 1. Verify all applicable lessons learned from the district database have been incorporated (at each design/review submittal).
- 2. Lesson Learned certification is required before RTA.

#### FIRE ALARM CHECKLIST

- 1. Determine what Codes and standards must be followed.
- 2. Determine the type of system to be used.
- 3. Check NFPA 72 and ADA/ABA to see if there are any special requirements.

# 4. Initiating Devices

- a. Manual pull stations
  - i. Every egress.
  - ii. Every level.
  - iii. 200 feet maximum horizontal travel distance.

#### b. Area detection

- i. Protect all areas, including above ceiling if needed.
- ii. Consider providing a catwalk for maintenance of detectors in inaccessible areas.
- iii. Consider remote LED for detectors above ceiling.
- iv. Place all detection devices at least 3 feet from HVAC diffusers on plans.

#### c. Heat detectors

- i. Reduce spacing if ceiling over 10 feet.
- ii. Adjust spacing and mounting if ceiling is not smooth (interrupted by joists, beams).
- iii. Adjust spacing if ceiling is not level (sloped).
- iv. All points on ceiling shall be within 0.7 times the detector's listed spacing after all adjustments.

# d. Smoke detectors

- i. Use 30 feet spacing as a guide.
- ii. Adjust spacing and mounting if ceiling is not smooth (interrupted by joists, beams).
- iii. Adjust spacing if ceiling is not level (sloped).
- iv. All points on ceiling shall be within 0.7 times the detector's listed spacing after all adjustments.
- v. Consider the stratification effects.

# e. Special Applications

- i. Use smoke detectors under raised floors and above ceilings if this area(s) is used as a return air plenum.
- ii. Insure detector is listed for the air velocities present.

- f. High air movement areas See NFPA 72.
- g. High rack storage areas See NFPA 72.
- h. Smoke door release See NFPA 72.
- i. Elevator recall for firefighter's service See NFPA 72 and ASME A17.1b.
- i. Flame detectors - See NFPA 72.

#### k. Duct Detectors

- i. Coordinate with the Mechanical Engineer.
- ii. From 2000-15000 CFM use detectors on supply
- iii. Above 15000 CFM use detectors on supply and return (multiple story).
- iv. Provide remote test station when detectors may be inaccessible.
- v. Show detectors on floor plans and on fire alarm riser diagram.

#### 5. Notification Devices

- a. Audible Alarms
  - i. Locate devices to provide sufficient sound level
    - 1. 15 dB above ambient.
    - 2. 5 dB above maximum for 60 seconds.
    - 3. Insure losses are taken into consideration:
      - a. Doubling the distance loses 6 dB.
      - b. Lose 25 dB through walls.
      - c. Lose 10 dB through doors.
  - ii. Provide device(s) on every floor.
  - iii. Provide device(s) for noisy areas (e.g. Mechanical and Break rooms).
  - iv. Provide device(s) in soundproof areas.
  - v. Provide device(s) in hallways sufficient to be heard when all doors are closed.
  - vi. Provide device(s) that have sounds distinct from the surrounding sounds.

#### b. Visual Alarms

- i. Space in accordance with (IAW) Tables in NFPA 72 and ADA/ABA.
  - 1. There are 2 separate Tables for rooms, corridors (less than 20 feet side) and sleeping areas.
  - 2. There are separate Tables for ceiling-mounted and wall-mounted appliances (which are not specifically allowed by ADA).

#### 6. Control Panel

- a. Where a design will tie into an existing system, be certain the new design will be compatible.
- b. Check existing wiring and FACP capacity.

- c. NFPA 72 lists the maximum number of devices for a zone.
- d. Consider maintenance when zoning detectors.
- e. For DC loop systems, put each of the following on an individual zone:
  - i. Fire Suppression System.
  - ii. Hazardous areas.
  - iii. Flow switches.
  - iv. Tamper switches for post indicator valves (PIVs).
  - v. Tamper switches for all control valves.
  - vi. Any other supervisory device.
  - vii. Fireman's service for elevators.
  - viii. Attic detectors.
  - ix. Pull stations.
  - x. Kitchen equipment.
  - xi. Notification appliances.
  - xii. Automatic door release.
  - xiii. Power shutdown to data processing equipment.
  - xiv. AHU shutdown.
- f. Provide manual override to AHU shutdown for testing purposes.
- g. Provide activation of fire alarms if kitchen equipment control panel is alarmed, where applicable.
- h. Annunciators
  - i. Avoid annunciators that only list the zones (these merely repeat information available from the fire alarm control panel.
  - ii. Use a graphic annunciator if an annunciator is needed.
  - iii. Show underfloor and above ceiling detectors.
- i. Signaling Equipment
  - i. Specify a transceiver with enough zones to transmit all facility information.
  - ii. Do not show conduit to TBB when radio is used.
- 7. Riser Diagram
  - a. Show FACP.
  - b. Power supply.
  - c. Signaling method.
  - d. Annunciator, if used.
  - e. All zones

# 8. Power Supply

- a. Primary Source:
  - i. Connections to light and power service must be on a dedicated branch circuit, with disconnecting means accessible only to authorized personnel.
  - ii. Insure the disconnecting means is locked/lockable if necessary.
- b. Secondary Source: Batteries most commonly used.
- c. Trouble Source: Shall be independent of the primary power.
- d. Provide non-supervised power for door holders.
- e. All fire alarm devices should be powered from the FACP.
- f. Show fire pump power ahead of all disconnecting means.

#### 9. Wiring

- a. Siring shall be Class A or B as required.
- b. Insure wiring compatibility when connecting to an existing system.
- c. Do not connect a 4-wire system to a 2-wire system.

# 10. Sprinkler System Electrical Supervision

- a. Coordinate with the Mechanical Engineer
- b. Flow switches
- c. Tamper switches on all control valves and PIVs.
- d. Pressure Tank:
  - i. Detect high and low pressure.
  - ii. Detect high and low water level.
- e. Dry-Pipe Pressure: Detect high and low pressure
- f. Steam Pressure: Detect low pressure.
- g. Water Temperature: detect and signal when below 40°F.
- h. Fire Pumps: Supervise according to NFPA 20.
- i. Show all supervising devices on floor plans and on fire alarm riser.
- j. Show air compressor used for the dry-pipe system on the power floor plans with hard-wired power connection.

# **Abbreviations and Acronyms**

ADA Americans with disabilities Act

**ARArmy Regulation** 

ASHRAE American Society of Heating Refrigeration and Air-Conditioning Engineers

BCOE Buildability, Constructability, Operability and Environmental issues

cd Candela (unit of light intensity)

dBA Decibels, A-Weighted scale

**EREngineering Regulation** 

**ETL** Engineering Technical Letter

**FACP Fire Alarm Control Panel** 

fc Footcandle

**HVAC Heating, Ventilation and Air Conditioning** 

IEEE Institute of Electrical and Electronic Engineers

**IESNA** Illuminating Engineers Society of North America

**IFB** Invitation for Bid

ITR Independent Technical Review

kVA kilovolt-ampere

**LAN Local Area Network** 

Lumen Light intensity per area

**MIL HDBK** Military Handbook

**MLO Mail Lugs Only** 

**NEC National Electrical Code** 

NFPA National Fire Protection Association

**PPTO Price Performance Tradeoff** 

**RFI** Request for Information

RFP Request for Proposal – graded on technical, experience, management, cost details

RTA Ready to Advertise (one of the Design Stages)

**TBB** Telephone Backboard

TI Technical Instruction

TMTechnical Manual

**UFC** Unified Facilities Criteria

**UFGS Unified Facilities Guide Specifications** 

**VE Value Engineering** 

# 2.0.1 Deliverables

#### Hard-copy Drawings

Final construction contract drawings and as-built drawings submitted for official government records shall be digital and placed on 24" x 36" plastic film (Mylar) sheets. Sheet border shall be provided by DPW-EDB. A graphic scale shall be shown on each sheet of the drawings.

Electronic drawings submitted for review shall be reproduced on 8-1/2" x 11" or 11" x 17" paper using a laser printer.

# **Digital Drawings**

CADD Drawings containing Geographic data (Site Plan, Survey and Mapping Plan, Storm Sewer Plan, Electrical Utilities Plan...) will use the Tennessee (TN) State Plane Coordinate System. The Datum used will be the North American Datum of 1983 (NAD83). The mapping units will be US feet. Vertical upland topographic surveys will use North American Vertical Datum (NAVD) 1988.

Digital geographic data will have accuracy within two feet unless otherwise stated in the Scope of Work.

Digital geographic data will be 99% free of topological errors including, but not limited to: the absence of dangling nodes, undershoots, overshoots, and snapped nodes for line segments (road centerlines, edge-of-curb, elevation contours...); the existence of features that have area square footage (building footprints, parking lots, sidewalks...) will have polygon representations in the CADD drawings.

All CADD drawings shall be done on Intergraph Microstation Release 8 or a compatible approved equal system.

The CADD Drawing file naming convention shall follow Chapter 2 of the "A/E/C CADD Standards" Document within the Spatial Data Standards Facilities/Infrastructure/Environment (SDS/FIE) model maintained by the CADD/GIS Technology Center (<a href="http://tsc.wes.army.mil">http://tsc.wes.army.mil</a>).

Layer/Level assignments of feature data within the CADD drawings will follow 'Appendix A: *Model File Level/Layer Assignment Tables*' of the "A/E/C CADD Standards" Document within the Spatial Data Standards Facilities/Infrastructure/Environment (SDS/FIE) model maintained by the CADD/GIS Technology Center (<a href="http://tsc.wes.army.mil">http://tsc.wes.army.mil</a>).

The "A/E/C CADD Standards" Document (26MB) are available at the following internet site: <a href="http://tsc.wes.army.mil/products/tssds-tsfms/tssds/projects/sds/">http://tsc.wes.army.mil/products/tssds-tsfms/tssds/projects/sds/</a>

To request an "A/E/C CADD Standard" CD, go to

http://tsc.wes.army.mil/comments/aecsds comments/AECSDS-CommentForm.asp and fill out the CD request form.

The 'CADD Drawing file naming convention' is referenced in the '\Release 2\_x Document\' folder on of the "A/E/C CADD Standards" CD. It is an Adobe Acrobat PDF document named 'volume1.pdf'. See Chapter 2 for 'CADD Drawing Naming Convention' standards.

The 'Layer/Level assignments of feature data within CADD drawings' is referenced in the '\Release 2\_x Document\' folder on the "A/E/C CADD Standards" CD. It is an Adobe Acrobat PDF document named 'volume1.pdf'. See 'Appendix A: Model File Level/Layer Assignment Tables' within the PDF document.

For MILCON projects, Drawings shall also be prepared in accordance with COE Standards available from the PE/A.

For OMA projects, Drawings shall also be prepared in CADD format using standard 24" X 36" sheets.

Drawings for all projects that are Ready to Advertise (RTA) shall be in the approved electronic format.

#### Specifications-

For MILCON projects, specifications for projects that are RTA shall be included only in the approved electronic format.

For OMA projects, Construction specifications shall be prepared as agreed in the Scope Definition Document. Specifications for projects that are RTA shall be included only in the approved electronic format.

# **Design Analysis**

For MILCON projects, design support documentation shall be provided. The Design Analysis shall be completed in the approved format. At the conclusion of the design effort, the documentation shall be provided in an approved electronic format.

# 2.0.2 Antiterrorist / Force Protection

All new construction projects including additions and alterations shall include antiterrorist / Force Protection (AT/FP) features in accordance with UFC 4-010-01, DOD Minimum Antiterrorism Standard for Buildings.

# 2.0.3 Fire Protection/Life Safety

Every project including MILCON and OMA shall be designed using only the following DOD directed criteria:

- <u>UFC 1-200-01, General Building Requirements</u> shall be used mandatory guidance concerning required model building codes for design and construction.
- Fire Protection requirements shall comply with <a href="UFC 3-600-01">UFC 3-600-01</a>, Fire Protection Engineering For Facilities.
- Exiting requirements shall comply with the Life Safety Code, NFPA 101.
- No asbestos containing materials shall be used for construction.

# 2.0.4 Metric Design

Consideration of Metric dimensioning (SI) is required for all MILCON projects. Project specific guidance is available through the Louisville District project PE/A.

For OMA projects, metric dimensioning is used on a case-by-case basis: If the original project was developed in English (IP) units, follow-on OMA projects can also use English inch-pound (IP) units. If the original documents were developed in metric units, the OMA projects must also be executed in metric.

# 2.0.5 Surveying and Mapping Requirements

Fort Campbell has the following control point network and datum requirements for every MILCON project.

- Two new control monuments shall be established on site and tied to Tennessee State Plane Coordinate System NAD 83.
- The survey control points are GPS Class I and Class II Horizontal with additional elevation coming from an off-post USGS Class I bench mark to establish Second Order Class II vertical on all survey control points.
- Hardcopy books of existing points (including sketches) are maintained at both Fort Campbell (POC Nick Tower (270) 798-2718) and the Louisville District (POC Chris Heintz (502) 315-6408.
- For work contracted by Louisville District, the contractor is required to establish a permanent baseline at the project. In areas where existing concrete monuments are abundant, iron pins with caps are allowed. The contractor supplies CELRL-ED-M-SM (Survey and Mapping Section) with description sheets for the points they establish and the District forwards the information to Fort Campbell.
- Similarly, OMA work performed by Fort Campbell will have the survey control point data reported to the DPW POC for forwarding to the District.

# 2.0.6 Geotechnical Requirements

The following is a list of aggregate sources for concrete, asphalt, stone-base, sub-base, and DGA which met or exceeded the quality standards set forth in the technical sections of the COE specifications for Fort Campbell projects:

Coarse material sources for base course, bituminous paving, cast-in-place structural concrete, concrete pavements, and pre-cast architectural concrete.

- Hopkinsville Stone, Hopkinsville, KY, Ledges 11 to 17, about 85 feet.
- KY Stone Company, Canton, KY, Ledges 2 and 3, about 33 feet.
- Vulcan Materials, Gilbertsville, Kentucky. Ledges 4 and 26, about 393 feet.
- Martin-Marietta Aggregates, Smithland, Kentucky, Ledges 16 to 19, about 51 feet.
- Vulcan Materials, Clarksville, TN, Ledges 16 & 17, about 30 feet.
- Winn Materials, Clarksville, TN, Ledge 3, about 20 feet.

Natural fine aggregate sources for concrete, asphalt, stone-base, subbase and DGA are listed below.

- Delta Materials, Henderson, Kentucky.
- · Ingram Materials, Paducah, Kentucky.
- Mayfield Aggregates, Mayfield, Kentucky.
- Delta Materials, Cairo, Illinois Manufactured fine aggregates for concrete:
- Hopkinsville Stone Company, Hopkinsville, Kentucky.

POC for further information at the Louisville District contact:

Mr. David Black (502) 315-6436

Mr. David Kiefer (502) 315-6445

# 2.0.7 Cost Engineering

Every project both MILCON and OMA requires a construction cost estimate. For MILCON projects the estimate shall be prepared using M-CACES software. Cost estimates for OMA projects shall be provided to the DPW at the time of submittal for bid issue. Official government cost estimates are not to be made public. They remain the property of the Government, and FOR OFFICIAL USE ONLY.

# 2.0.8 Engineering Considerations and Instructions for Field Personnel

This documentation is required for all MILCON projects, and is normally a part of the Design Analysis. It offers the designers an opportunity to provide a written document providing important design facts to the construction field personnel. An example format of the <a href="Engineering Instructions">Engineering Instructions</a> is provided, which shall be revised and reflect project specific information.

# 2.0.9 Transfer and Acceptance

Completion of the Transfer and Acceptance of Military Real Property, DD Form 1354 is required for all projects. A draft copy of this information must be submitted with the Final Design submittal. This requirement applies to both MILCON and OMA program projects.

# 2.1 Special Ft. Campbell Criteria

# 2.1.1 Army Energy Program

- 2.1.1.1. AR 420-1, Chapter22-4k(5), "Provide and require a prescriptive energy design guide for every scope of work at every installation if one is not in use or available."
- 2.1.1.2. Title I, Subtitle A, Section 104 of EPACT 2005, "To meet the requirements of an Agency for an energy consuming product, the head of the agency shall...procure an Energy Star product or FEMP designated product."

2.1.1.3. Title V, Subtitle C, Section 523 of EISA 2007, "[I]f lifecycle cost-effective, as compared to other reasonably available technologies, not less than 30 percent of the hot water demand for each new Federal building or Federal building undergoing major renovation be met through the installation and use of solar hot water heaters."

- 2.1.1.4. Title II, Subtitle A, Section 203a, Energy Policy Act (EPACT) of 2005 "... of the electric energy the Federal Government consumes during any fiscal year, the following amounts shall be renewable energy: (1) Not less than 3 percent in fiscal years 2007 through 2009" 2.1.1.5. Section 2, Executive Order 13423 "ensure that at least half of the statutorily requires renewable energy comes from new renewable sources."
- 2.1.1.6. The National Defense Authorization Act (NDAA) of 2007 signed on October 17, 2006 codified DoD's voluntary renewable energy goal of using 25% renewable energy by 2025.

# 2.1.2 Historic District

The "Clarksville Base" portion of Ft. Campbell cantonment area is eligible for the National Register of Historic Places as a significant Cold War historic district. Designers are required to consult with the State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation for any projects that are sited at the Clarksville Base. POC is DPW Environmental Division Cultural Resource Manager at 270-798-7437.

# 2.1.3 Environmental

The Environmental Division is under the guidance of the Directorate of Public Works at Fort Campbell. The **Environmental Division** Internet address will provide added information and points of contact.

**Environmental Compliance** is mandatory for all projects.

- **Designers shall NOT contact Kentucky or Tennessee regulators** regarding environmental issues. Contact the Ft. Campbell Environmental Div.
- A 40-hour "Environmental Quality Officer" course is available bi-monthly on post by Ft. Campbell's Environmental Division. Designers are encouraged to attend.
- Designs shall take into consideration wetlands and endangered species on the installation.
- Several environmental topics contained in this document include the following:

#### APPENDIX A:

**Occupational Health Considerations** 

**Clean Air Act** 

**Clean Water Act** 

**Safe Drinking Water Act** 

Toxic Substance Control Act (Lead Based Paint and Radon)

FIFRA (Pesticides)

**Solid Waste Disposal/Diversion Practices** 

**Hazardous Waste Disposal Practices** 

**Emergency Planning and Community Right to Know** 

**NESHAP** National emission standards for hazardous air pollutants

# 2.1.4 Underground and Aboveground Storage Tanks

Aboveground and underground petroleum product storage tanks shall not be permitted at new construction projects without design review and approval by the Directorate of Public Works, Environmental Division, Petroleum Storage Tank Program Manager.

Underground Storage Tanks (USTs) shall not be installed without approval from the DPW Environmental Division. If permitted, USTs shall be double walled steel fiberglass coated with interstitial monitoring and automatic tank gauging. The monitoring system shall be compatible with the systems already in use and capable of being remotely monitored by the Environmental Division. No used oil USTs shall be installed.

Above Ground Storage Tanks (ASTs) shall not be installed without approval from the DPW Environmental Division. If permitted, ASTs shall follow requirements outlined in the Ft. Campbell: <u>Standard Design Requirements For Aboveground Fuel Tanks</u> prior to submission for permit requests.

Design for used petroleum products holding and storage shall not include tanks. Only 55-gallon drum containers shall be used that are placed on approved pavement materials properly designed for hazardous spill containment.

# 2.1.5 Solid Waste Disposal / Recycling Diversion Practices

In the interest of reducing waste, Fort Campbell is actively recycling and reducing waste in all on-post operations. Contractors are required to participate in on-post programs. They are encouraged to find ways of reducing waste. Recycling shall be practiced to the maximum extent possible. Refuse materials shall be separated in accordance with installation policies and practices.

It is the intent of the installation to divert at least 50% (by weight) of all construction, renovation, and demolition debris from the Woodlawn C/D landfill. Recyclable waste materials shall not be landfilled on or off post. Recyclable materials shall be transported to designated locations for recycling or reuse.

Contractors must evaluate all diversion options and make good-faith effort to achieve the highest diversion rate within the project schedule and budget.

Contract specifications shall require at least a 50% diversion of construction and demolition (C & D) waste materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post. Construction specifications shall require a C&D Waste Management Diversion Plan to be submitted and approved by DPW.

All material disposal and diversion shall be handled in accordance with Appendix A-7, Solid Waste Disposal/Diversion Practices. Salvageable materials shall be disposed of as per the contract specifications. If salvageable materials are transported off the installation, the contractor shall provide the project COR with the following information, type of material, method of disposal, and weights of material.

# 2.1.6 Erosion and Sedimentation Control

Erosion and sedimentation control is required for activities that result from opening, operating, and closing all site excavation and excavation at present and planned borrow pits on the Fort Campbell Military Reservation.

The requirements contained in the Appendix I, <u>Erosion and sedimentation Control</u> shall apply at Fort Campbell, KY by its military units and all authorized subcontractors. It provides step-by-step procedures to help plan, design, and install soil and water Best Management Practices (BMP). It does not override any local, city, county, state, or federal rule, regulation, or law, including job safety and utility safety laws. Where there is a difference between this plan and any language contained in any contractual document, the contractual document must be followed.

The guidance provides criteria for the design, installation, and maintenance of water management and sediment control practices to abate nonpoint source (NPS) Pollution. Those responsible for design of these practices should evaluate the conditions existing on a particular site and determine if the minimum criteria contained in these standards are adequate or if more stringent criteria should be used.

Properly applied, this information will provide an efficient plan to operate the borrow pit site(s) while ensuring maximum safety and minimizing adverse impact to the environment. By following these guidelines, it is the intent of this management tool to furnish a uniform plan that will provide continuity throughout the life of the borrow pit.

# 2.1.7 Permits

Local permits are required for construction activities at Ft. Campbell. These permits must be Contractor completed and submitted prior to beginning any construction effort. Contract documents must identify and contain permits that will apply to the contract. Local permits shall include demolition, excavation, compaction, electrical, fuel tank installation, and environmental. Several of the specific permit forms that apply are located within this document along with information identifying appropriate installation drop-off locations and points of contact.

# **Borrow Permits**

In addition, Specifications requirements shall include Contractor requirements for obtaining all utility and state (Kentucky or Tennessee) permits. These are related to utility services and various environmental topics.

# 2.1.8 Mold and Moisture Control:

Design features identified in Appendix G are critical to long term building environmental quality. They shall be incorporated into all projects.

# 2.1.9 Fort Campbell DPW Computer Software Capabilities:

Software capabilities may vary within the DPW. To assure that electronic files can be accessed, the following versions of software are commonly utilized in the DPW:

Microsoft Office

Ver 08.11.07.443 2010 2007

Digital files being transferred to Fort Campbell should be saved to allow accessibility with the above software. Files shall not be "write protected" or "view only".

# 2.1.10 Installation Internet Addresses

Ft. Campbell

**The Directorate of Public Works** 

**Return to Table of Contents** 

# **GENERIC SCOPE DEFINITION DOCUMENT**

The following 2 pages contain a generic example of standardized "Scope Definition Document" which is required for each military O&M task order.

Items in black are part of the standard format.

Items in red are project task order specific, and should be changed for each customer request.

Items in blue are options to be considered.

# DEPARTMENT OF THE ARMY U. S. ARMY ENGINEER DISTRICT, LOUISVILLE CORPS OF ENGINEERS

# SCOPE DEFINITION DOCUMENT For PROJECT NAME

At LOCATION

#### Date

1. BACKGROUND: Public Works Center, Detroit Arsenal defined a need for roof replacement on Buildings 229 & 231 at the Warren, MI facility (Site Map - see Enclosure 1), due to leaks and the age of the existing roofing material. There is also work slated to repair & replace air-handling units on these roofs under a separate contract prior to this replacement. Nick Ballard (ED-D-A) attend the meetings, surveyed the structures and obtained photographs and drawings for COE Louisville. This is a year-end funded design Project and must be finalized by mid-September 2000.

Information for this Scope of Work was acquired during a site visit to Detroit Arsenal on June 27, 2000 with the following personnel in attendance at meetings or the site. Kirk Dailey & Nick Ballard COE – Louisville; Jim Park (DPW Director), Bob Novak (Chief of Engineering Plans and Services) & Nabil Tominna (Project PE/A) of PWC Detroit Arsenal.

2. DESCRIPTION OF WORK: Each building is approximately 42,000 S.F. with 5400 S.F. of Penthouse roof and 36,600 S.F. of main roof with typical rooftop equipment. (Bldg. Photos - see Enclosure 2). All building equipment and problems were surveyed during the site visit and noted for review and plan preparation. (Field Notes - see Enclosure 3). PWC Detroit Arsenal provided 11 existing drawings pertinent to this roof project. (Reference Drawings - see Enclosure 4) They will also provide information as to equipment to be abandoned, capped off, removed and utility line rerouting. The customer has requested informal reviews when construction contract documents are approximately 50% complete, and a final review when 100% complete.

Initial discussions derived at the site visit and discussions indicated that the customer preferred replacement be a Modified Bitumen Roof. Existing built-up roofing is approximately 20 years old, and although in very good condition, will soon need replacement. No major environmental hazardous conditions exist. (Asbestos Reports – see Enclosure 5).

The customer also stated that he would like to receive contractor furnished an Operations and Maintenance Manual, including the manufacturers' cut-sheets showing recommended future roof penetration methods.

Special Environmental Concerns or Requirements and Responses:

Lead Based Paint Removal: None

Asbestos Abatement: (4) Roof samples being taken contained no

asbestos.

Other: None

• Fire Protection or Life Safety Concerns or Requirements: None

Special work sequencing or Optional items: None

1. SCOPE OF DELIVERABLES TO BE PROVIDED:

Design: [Simplified Design Method Plans and Specs]
Review: ?? sets ½ full size CAD prints & Specs – hard copy

Contract: (1) Electronic CD/Hard disc to DOC

Post Award: All final records, and (1) electronic version Microstation drawings & specs

- 4. TYPE OF CONSTRUCTION CONTRACT: Job Order Contractor (JOC)
- 5. DESIGN TEAM & DPW REVIEWERS:
  - COE Louisville: N. Ballard, J. Jaggers, G. Minter (QC) / M. Mirzaian (PE/A)
  - DPW: Engineering:

Master Planning:

Environmental

Maintenance Shops:

Safety:

Fire Department:

ITBC: End User:

- 6. DESIGN COST ESTIMATE: \$15,000 (See Attachment 1)
- 7. DESIGN SCHEDULE: 10 July to 10-12 September 2000
- 8. CONSTRUCTION COST ESTIMATE: Base Bid: \$480,000

Option 1: \$518,000

9. QUALITY EXPECTATIONS: Minimum QCP w/ one A/E reviewer. When signed by all parties, this document becomes the contract with the ED customer.

This package has been completed and assembled by the PE/A: Nicholas M. Ballard

This assembled complete package has been checked for completeness and compliance with the Engineering Division Quality Operating System.

Any change in any one of the items above will require a modification of this contract.

ED PE/A Name: Nicholas M. Ballard
ED Unit Name: ED-D-A
Signature: Signed: 11 August 2000

Customer Name: Kirk P. Dailey
Customer Office Symbol: PM – M
Signature: Date Accepted: 11 August 2000

**Return to Table of Contents** 

# **EXAMPLE Engineering Considerations and Instructions for Field Personnel**

#### **B-1** General

B-1.1 Contractor's construction trailers on site must be wired per NEC, meet separation clearances, have electric meters but no water meters. COE is to coordinate with DPW Master Plans and utility personnel.

#### **B-2** Civil

- B-2.1 Notification of road closures during construction shall be given to the following agencies:
  - Provost Marshall Office, Traffic Section (270) 798-6812.
  - Directorate of Public Works, Master Plans, (270) 798-5643.

#### B-3 Geotechnical

- B-3.1 During stripping and rough grading, positive surface drainage should be maintained to prevent the accumulation of water. The exposed subgrade materials are likely to be soft in some locations. Also, if conditions are encountered which are different from those described in the plans, the geotechnical engineer should be notified. Once subgrades are established, concentrated loads from construction equipment could cause pumping of the subgrade and require re-compaction.
- B-3.2 Foundation designs are based on the subsurface investigation program. To verify that the foundation designs are appropriate for the structures, inspection by Corps of Engineers of the footings and undercutting is very important. Linda Davis (502) 315-6437 or Steve Durrett should be notified of the contractor schedule for performing earthwork and foundations so that inspections of the materials can be performed.

# **B-4** Utilities / Landscaping

- B-4.1 Care should be taken in placement of underground utilities so as not to cause interference with landscaping trees.
- B-4.2 Railroad crossings for gas and water piping are to be included in the drawings. The portion of the AREA-03 (the reference from which the details are taken) dealing with railroad crossings is included with these instructions.

- B-4.3 Where gas and water piping are shown to be valved and capped for future expansion, the valve should be a gate valve. These are installed to prevent the need to shut down a section of the main and interrupt service in order to connect a new service line.
- B-4.4 Valves should been placed to isolate each building from the main service (water and gas), and to allow only for minimal main shut down when tying to existing main lines.

#### **B-5** Architectural

B-5.1 Hold metal roofing pre-submittal meeting, with construction, supplier, and contractor to discuss standing seam metal roof system specifications.

**Return to Table of Contents** 

# **Back To Section**

# TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 00 Procurement and Contracting Requirements

# **SECTION 00 22 13 Supplementary Instructions to Bidders**

# Ft. Campbell Requirements

Ft. Campbell Specification Section 00 22 13, Supplementary Instructions to Bidders, shall apply to <u>all MILCON</u> projects and OMA projects issues by the Fort Campbell Directorate of Contracting (DOC) or COE.

# **Instructions to Designers**

- 1. Modify the project specifications paragraphs as necessary to include all applicable portions of the Ft. Campbell Technical Design Guide:
- 2. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

# Section 00 22 13: Supplementary Instructions to Bidders

- 20. WARRANTY OF CONSTRUCTION (MAR 1984) ALTERNATE 1 (APR 1984) FAR 52.246-21I.
  - 20.1 General Requirements.

20.1.1 In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph 20.1.10 of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

# 20.1.1.1 Warranty Payment.

Warranty work is a subsidiary portion of the contract work, and has a value to the Government approximating 1% of the contract award amount. The Contractor will assign a value of that amount in the breakdown for progress payments mentioned in the Contract Clause: Payments Under Fixed-Price Construction Contracts. If the Contractor fails to respond to warranty items as provided in paragraph 20.5, the Government may elect to acquire warranty repairs through other sources and, if so, shall backcharge the Contractor for the cost of such repairs. Such backcharges shall be accomplished under the Changes Clauses of the contract through a credit modification(s).

- 20.1.1.2 Since the warranty period will extend beyond the construction completion date, this contract shall remain open until the warranty period expires.
- 20.1.2 This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.
- (a) As a part of the one year warranty inspection, the Contracting Officer will conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for the Location of Wet Insulation in Roofing Systems Using Infrared Imaging". In accordance with paragraph 20.1.3 and 20.1.4, the Contractor shall be required to replace all damaged materials and to locate and repair sources of moisture penetration, at no additional cost to the Government.
- 20.1.3 The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--
  - (a) The Contractor's failure to conform to contract requirements; or
    - (b) Any defect of equipment, material, workmanship, or design furnishes.
- 20.1.4 The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.
- 20.1.5 The Contracting Officer shall notify the Contractor, in writing, (see para. 20.2.3 and 20.5) within a reasonable time after the discovery of any failure, defect, or damage.

- 20.1.6 If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, (see para. 20.5) the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- 20.1.7 With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--
  - (a) Obtain all warranties that would be given in normal commercial practice;
  - (b) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and
- (c) Provide names, addresses, and telephone numbers of all subcontractors, equipment suppliers, or manufacturers with specific designation of their area of responsibilities if they are to be contacted directly on warranty corrections; and
  - (d) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.
- 20.1.8 In the event the Contractor's warranty under paragraph 20.1.2 of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.
- 20.1.9 Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.
- 20.1.10 This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.
- 20.1.11 Defects in design or manufacture of equipment specified by the Government on a "brand name and model" basis, shall not be included in this warranty. In this event, the Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties, in writing, directly to the Government.
  - 20.2 Performance Bond.
  - 20.2.1 The Contractor's Performance Bond will remain effective throughout the construction warranty period and warranty extensions.
  - 20.2.2
- (a) In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Contracting Officer shall have the work performed by others, and after

Page 571 of 947

completion of the work, will charge the remaining warranty funds established by paragraph 20.1.1.1 of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

- (b) In the event sufficient funds are not available to cover the warranty work performed by the Government at the Contractor's expense, the Contracting officer shall have the right to recoup expenses from the bonding company.
- 20.2.3 Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 20.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor as outlined in the paragraph 20.2.2 above.
  - 20.3 Pre-Warranty Conference.

Prior to contract completion and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

- 20.4 Equipment Warranty Identification Tags.
- 20.4.1 The Contractor shall provide warranty identification tags on all Contractor and Government furnished equipment which he has installed.
- (a) The tags shall be similar in format and size to the exhibits provided by this specification, they shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Contractor furnished equipment that has differing warranties on its components will have each component tagged.
- (b) Sample tags shall be submitted for Government review and approval. These tags shall be filled out representative of how the Contractor will complete all other tags.
- (c) Tags for Warranted Equipment: The tag for this equipment shall be similar to the following. Exact format and size will be as approved.

**EQUIPMENT WARRANTY** CONTRACTOR FURNISHED EQUIPMENT MFG MODEL NO. SERIAL NO. CONTRACT NO. **CONTRACTOR NAME CONTRACTOR WARRANTY EXPIRES** MFG WARRANTY(IES) EXPIRE **EQUIPMENT WARRANTY GOVERNMENT FURNISHED EQUIPMENT** MFG MODEL NO. SERIAL NO. CONTRACT NO. DATE EQUIP PLACED IN SERVICE MFG WARRANTY(IES) EXPIRE

Section: Appendix DD

<sup>(</sup>d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag. The Contractor warranty expires (warranty expiration date) and the final manufacturer's warranty expiration date will be determined as specified by para. 20.1.

- 20.4.2 Execution. The Contractor will complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.
- 20.4.3 Payment. The work outlined above is a subsidiary portion of the contract work, and has a value to the Government approximating 5% of the value of the Contractor furnished equipment. The Contractor will assign a value of that amount in the breakdown for progress payments mentioned in the Contract Clause: PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS.
- 20.4.4 Equipment Warranty Tag Replacement. As stated in para. 20.1.4, the Contractor's warranty with respect to work repaired or replaced shall run for one year from the date of repair or replacement. Such activity shall include an updated warranty identification tag on the repaired or replaced equipment. The tag shall be furnished and installed by the Contractor, and shall be identical to the original tag, except that the Contractor's warranty expiration date will be one year from the date of acceptance of the repair or replacement.
  - 20.5 Contractor's Response to Warranty Service Requirements.
- 20.5.1 Following oral or written notification by the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. If the Contractor does not perform the warranty within the timeframe specified, the Government will perform the work and backcharge the warranty payment item established under paragraph 20.1.1.1.

First Priority Code 1 Perform on site inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

Second Priority Code 2 Perform on site inspection to evaluate situation and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

Third Priority Code 3 All other work to be initiated within 3 work days and work continuously to completion or relief.

The "Warranty Service Priority List" is as follows:

# Code 1 Air Conditioning Systems

- a. Recreational support.
- b. Air conditioning leak in part of building, if causing damage.
- c. Not cooling unit

#### Code 3 Doors

- a. Overhead doors not operational.
- b. Interior/Exterior personnel doors or hardware not functioning properly.

#### Code 1 Electrical

- a. Power failure (entire area or any building operational after 1600 hours).
- b. Security lights.
- c. Smoke Detectors.

#### Code 2 Electrical

- a. Power failure (no power to a room or part of building).
- b. Receptacle and lights (in a room or part of building).

#### Code 3 Electrical

a. Street Lights.

#### Code 1 Gas

- a. Leaks and breaks.
- b. No gas to family housing unit or cantonment area.

#### Code 1 Heat

- a. Area power failure affecting heat.
- b. Heater in unit not working.

#### Code 1 Hot Water heater Failure

# Code 2 Kitchen Equipment

- a. Dishwasher.
- b. All other equipment hampering preparation of a meal.

#### Code 3 Plumbing

a. Leaky faucets.

# Code 2 Plumbing

- a. Flush valves.
- b. Fixture drain, supply line commode, or any water pipe leaking.
- c. Commode leaking at base.

- Code 3 Interior
  - a. Floors
  - b. Paint chipping or peeling
  - c. Casework
- Code 1 Roof Leaks

Temporary repairs will be made where major damage to property is occurring.

Code 2 Roof Leaks

Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 2 Water (Exterior)

No water to facility.

Code 2 Water, Hot

No hot water in portion of building listed

Code 3 All other work not listed above.

20.5.2 Should parts be required to complete the work and the parts are not immediately available the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

**Return to Table of Contents** 

# TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 01 General Requirements

# **Section**

01 74 19

01 35 26	Government Safety Requirements
01 50 00	<b>Temporary Construction Facilities and Controls</b>
01 57 20.00 10	Environmental Protection
01 57 23	Storm Water Pollution Protection

**Construction and Demolition Waste Management** 

# SECTION 01 35 26 Government Safety Requirements

# Ft. Campbell Requirements:

#### 1. Fall Protection

All new and/or roof replacement projects (sloped roofs only) will incorporate the installation of a permanent fall protection system which meets the requirements of ASHA Guideline 1926:502 (d) (16) (ii-iii-iv). This system shall be similar or equal to a Super Anchor system as manufactured by Super Anchor Safety, 8522 216<sup>th</sup> Street SE, Woodinville, WA 98072-8009 (Phone 425-488-8868).

#### 2. Utilities

Ft. Campbell requires contractors have buried utilities marked prior to starting any excavation/digging. Fort Campbell has stopped using dig permits. Instead, Tennessee One Call is now being used to locate buried utilities prior to digging/excavation (800-351-1111). See <a href="Appendix C">Appendix C</a> for further information. If contractor cuts utility lines after being marked or does not get them marked he should be responsible for making **immediate** repairs (to be coordinated with the appropriate Government maintenance entity or be billed for repairs if the Government makes the repairs.

Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Avoid locating new utility lines under pavement where possible. When utilities are required to cross under roads/streets, boring is required (no cutting of pavement is to be done). Exceptions can be granted with written approval of the Director of Public Works. When underground utilities are sleeved under roadways, sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect lines from penetration by new road signs, poles, etc.

#### 2. Execution

The Contractor will include the following in the site specific Accident Prevention Plan to ensure that each employee is familiar with and complies with the below procedures and USACE EM 385-1-1, Section 33 Munitions and Explosives of Concern (MEC) during investigation activities. a. Recognize. Recognize the hazard and do not touch, disturb, or move the item as it could detonate with movement or ground vibrations. b. Retreat. Stop work, mark the general location, and have everyone retreat from the area. c. Report. Report the situation immediately to the appropriate local emergency response authority (i.e., call 911 or the equivalent on DoD installations), providing as much information as possible about the items encountered. USACE personnel should also notify their project chain of command, District Safety Office, and installation staff as appropriate.

# **Instructions to Designers:**

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that are no shown on Base utility maps. Therefore, prior to starting any digging, utilities are to be marked.

Accessibility Standard for Federal Facilities. By memo on 31 October 2008 DOD adopted ABA Chapters 1 and 2 and Chapters 3 through 10 as its <u>standards</u> (the "DoD standards") under the ABA and also under Section 504 of the Rehabilitation Act. Subject to the special provisions specified in the attachment provided on DoD facilities, which is also part of the DoD standards, you are directed to meet the requirements of ABA Chapters 1 and 2 and Chapters 3 through 10, and to require recipients of financial assistance from your organization to do the same". These standards can be found at: <a href="http://www.access-board.gov/ada-aba/aba-standards-dod.cfm">http://www.access-board.gov/ada-aba/aba-standards-dod.cfm</a>.

# **SECTION 01 50 00 Temporary Construction Facilities and Controls**

# **Electricity**

Temporary electric service – temporary electric service on a cost reimbursable basis is available for construction office trailers, powers tools, etc. Contractors are responsible for all temporary electric service poles, panels, wiring, conduit, etc. Coordination for meter service shall be

with Rick McCoy Garrison Energy Manager, DPW Utilities Branch, Bldg. 865, e-mail james.r.mccoy76.civ@mail.mil or Karen Kopp-Voshel, Utilities Energy Engineer, Bldg. 865, phone 798-9724, e-mail karen.y.kopp-voshel.civ@mail.mil.

A 200 amp meter base shall be provided by the contractor. The meter bases shall be rated for 120/240 volts; container four meter jaws and one connection point for the neutral conductor; be at least 4-1/4 inches deep, 11 inches wide and 14' high; accept 2-1/2 inch rigid steel conduit; and have lugs (electrical connectors) that are marked to accept 4/0 aluminum conductors (See proper installation of temporary meter in **Fig 1-50** at end of this section). Services larger than 200 amp shall be coordinated with the DPW Utilities Branch.

DPW Utilities Branch will provide the meter after approval of electrical equipment by the Fort Campbell Electrical Inspector. A representative for the Contractor shall be present for the setting/removal of the electric meter to witness and sign off acknowledging the serial number, starting/ending reading, and billing information for the electric meter. After the meter is installed, the contractor will contact the DPW Electric Distribution Shop for energizing of the electric service. No part of the electric service shall be energized until the meter is installed.

The prime contractor for the temporary electric service will submit monthly meter readings and payment for electric service no later than the 5<sup>th</sup> of each month to:

**DPW Utilities Branch** 

P.O. Box 1172

Fort Campbell, KY 42223

Meter reading documentation format shall be provided by the COR or other Corps of Engineers personnel. Meter reading reports shall be signed by a prime contractor representative and a Corps of Engineer representative.

# **Water**

The Fort Campbell water distribution was privatized in 2003. The owner of the system is CH2MHill. Contact Chris Semler (CH2MHill), 931-980-7223) regarding requirements and costs associated with providing temporary water service.

### **Sewer**

The Fort Campbell water distribution was privatized in 2003. The owner of the system is CH2MHill. Contact Chris Semler (CH2MHill), 931-980-7223) regarding requirements and costs associated with providing temporary sewer service.

# **Communications**

Contact ATT (1-866-620-6000) for temporary phone, FAX, internet connections.

Fig 1-50

not meet the required 25 ohms or less

\*\*NEC Article 250.56 for an additional electrode when one does

Page 579 of 947

# SECTION 01 57 20.00 10 Environmental Protection

# Ft. Campbell Requirements:

Ft. Campbell specification Section 01 57 20.00 10, Environment Protection shall be used in all COE and DPW prepared projects.

# **Instructions to Designers:**

Additional required guidance is found in **Appendix A**.

For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

#### PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

# 1.2 SUBMITTALS

The following shall be submitted in accordance with Section C-01300 SUBMITTAL PROCEDURES:

### 1.2.1 SD-8, Statements

Work Plans; GA.

#### 1.2.1.1 Environment Protection

Prior to commencement of work at the site, the Contractor will submit within 10 calendar days after Notice to Proceed, his written detailed proposal for implementing the requirements for environmental pollution control specified herein. The contractor will then meet the representatives of the Contracting Officer upon their completion of review of his proposal as needed for compliance with the environmental pollution control program.

# 1.2.1.2 Preconstruction Survey

Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey, after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs, and grassed areas immediately adjacent

to the site of the work and adjacent to his assigned storage area and access routes(s) as applicable. This report will be signed by both the Contracting Officer and Contractor upon mutual agreement as to its accuracy and completeness.

# 1.2.1.3 Waste Disposal Scheme

As part of his proposed implementation under Paragraph 3.2, and prior to onsite construction, the Contractor shall submit a description of his scheme for disposing of waste materials resulting from the work under this contract. If any waste material is dumped in unauthorized areas, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed areas. Where directed, contaminated ground shall be excavated, disposed of as approved, and replaced with suitable fill material, all at the expense of the Contractor.

#### PART 2 POLLUTION PREVENTION PLANS

#### 2.1 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with all Federal, State, and local regulations.

#### 2.1.1 Environmental Protection Plan

The contractor will develop a site specific Environmental Protection Plan which will address in detail the following:

# a. Hazardous materials (HM) to be brought onto the post

Any hazardous materials planned or used on the post by the contractor will be managed with the same intent and purpose as the Hazardous Materials Management Program (HMMP) maintained by the DPW Environmental Division Pollution Prevention Branch. Ft. Campbell's HMMP was established to maintain effective and regulatory compliant management of hazardous materials used on the post. The HMMP provides establishment of source reduction methods, recycling and reuse opportunities, modifications of processes and procedures, shelf life management, authorized HM use list, full visibility of all HM at any given time, the least toxic and least amount of HM acquired, stored, or used, and proper handling, storage, and disposal of all HM. A hazardous material as per 29 CFR 1910.1200 will be included. A hazardous material as per 29 CFR 1910.1200 is any material which is a physical or health hazard. The Contractor shall complete the FTCKY HAZMAT INVENTORY FORM, which appears as an appendix to this section. The inventory form requires a list (including quantities) of HM to be brought to the post and copies of the corresponding material safety sheets (MSDS). The completed form shall be submitted to the Contracting Office representative and to Fort Campbell Environmental Division - Pollution Prevention Branch. In the event the usage of additional Hazardous Materials are found necessary during the project, they will be included into the MSDS package of the Environmental Protection Plan. At project completion, any hazardous material brought

onto the post shall be removed from the site by the Contractor. Ft. Campbell is required by Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements", to comply with the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA requires Ft. Campbell to identify the amounts of chemicals present on, or released from its facilities, understand the potential problems that hazardous materials pose to the surrounding communities and environment, and provide information to the public and local emergency planning organizations. To comply with EPCRA requirements, Ft. Campbell must track and be accountable for hazardous materials (HM) used throughout the post. As required by the Emergency Planning and Community Right - to - Know Act (EPCRA), the Contractor will account for the quantity of HM brought to the post, the quantity used or expended during the job, and the leftover quantity which (1) may have additional useful life as HM and shall be removed by the Contractor, or (2) may be hazardous waste, which shall then be removed as specified herein. This information will be provided to the Environmental Division Pollution Prevention Branch on a calendar year basis or project basis if less than a single calendar year, and must be submitted by the end of January following the year reported.

### b. Hazardous waste (HW) generated

The Environmental Protection Plan must list, quantify explain how any HW generated during the project will be disposed. Disposal of hazardous waste generated by the contractor shall be disposed off site according to applicable regulations at the contractor's expense. A report must be submitted annually of the generation of hazardous waste on post and must be provided to the Contracting Officer representative and to Environmental Division - Pollution Prevention Branch.

### c. Storage of hazardous waste

In accordance with post regulations and 40 CFR 262, hazardous waste shall be stored near the point of generation up to a total quantity of (one quart) 1 L of acutely hazardous waste or (55 gallons) 200 L of hazardous waste (Satellite Accumulation Point). Any volume exceeding these quantities shall be moved to a HW permitted area within 3 days. Locations of hazardous waste storage areas must be approved by DPW-ED-PP. Containers must be labeled in accordance with 40 CFR 262 and must contain the words Hazardous Waste and other words which identify the contents of the container. Prior to shipment of hazardous waste on site or off, the waste must be placed into good condition. Department of Transportation (DOT) specification containers for hazardous waste (49 CFR 172.101). Containers must be labeled with required labels for HW and for DOT shipping. The area selected for the storage of hazardous wastes must minimize the threat to human health or the environment in the event of a release.

#### d. Minimization of hazardous waste

In accordance with post regulations, the Contractor should substitute materials as necessary to reduce the generation of HW and include a statement to that effect in the Environmental Plan.

### e. Environmental conditions likely to be encountered during this project

Contact the Contracting officer for conditions in the area of the project which may be subject to special environmental procedures. Include this information in the Preconstruction Survey. Describe in the Environmental Plan any permits required prior to working the area, and contingency plans in case an unexpected environmental condition is discovered.

f. Any Hazardous Waste removal or disposal must be manifested through Environmental Division's Pollution Prevention Branch, Hazardous Waste Program Manager and must be signed and numbered. Permitting plans for any transportation and disposal, excavation, or construction of hazardous waste that will require an environmental permit from an issuing agency

The Contractor is responsible for generating the permits and delivering the completed documents to the Contracting Officer. The Contracting Officer will review the permits and the Contractor shall file the documents with the appropriate agency and complete disposal with the approval of the Contracting Officer. The Contracting Officer shall advise Environmental Plan of any Hazardous Waste generated and shall send contractor to Environmental Pollution Protection Branch. Correspondence with the State concerning the environmental permits and completed permits shall be delivered to the Contracting Officer.

#### g. Radon mitigation design and testing

All residential and non-residential construction performed at Fort Campbell must have passive radon mitigation features implemented into the design. The contractor will install preliminary features as per drawings. The contractor will hire an independent testing company to perform radon monitoring prior to inhabitation of the units. The testing firm must be EPA accredited and approved to perform work in the State of Tennessee (Kentucky). A list of accredited testing firms in the state of TN (KY) can be obtained through the state Radon Program Coordinator (615) 532-0733. In the event radon concentrations greater than 4 pCi/L (pico curies per liter of air) are revealed consult Fort Campbell DPW through the Contracting Officer's representative for guidance pertaining to retesting. If upon further testing, elevated (unacceptable)levels are present, additional mitigation features will be installed followed by more testing. The buildings will not be inhabited until levels of less than 4 pCi/L have been achieved.

Extend the pipe of the passive radon mitigation system through the roof and leave it open (do not Cap).

Place electrical outlets near (e.g. within 6 feet) of the radon vent pipe riser in the attic.

The riser should be located in an area of the attic with at least 3-4 feet of clearance to allow for easy access to install and maintain the fan.

If at all possible, the aggregate bed under the slab should not be compacted in order to provide the maximum subslab vacuum coverage.

With respect to the number of risers, suggest an interval of 1 for every 3-5000 SF of slab.

#### 2.1.1.1 Environmental Protection Plan Format

The Environmental Protection Plan shall follow the following format:

- 1. Hazardous materials to be brought onto the post
- 2. MSDS package
- 3. Employee training documentation
- 4. Hazardous materials/waste storage plan
- 5. Hazardous waste to be generated
- 6. Pre-construction survey results
- 7. Permitting requirements identified
- 8. Waste Disposal Plan
- 9. Site Specific Spill Contingency Plan

#### 2.1.1.2 Environmental Plan Review

Fourteen days after the environmental protection meeting, submit to the Contracting Officer the proposed environmental plan for further discussion, review, and approval.

#### 2.1.1.3 Commencement of the Work

As directed by the Contracting Officer, following approval.

#### 2.1.2 Storm Water Pollution Prevention Plan

The following Pollution Prevention Plan is incorporated into the contract documents as a portion of the construction activities to be undertaken by the Contractor. The plan as outlined below contains the minimum requirements for the work under this contract.

# POLLUTION PREVENTION PLAN FOR (PROJECT)

The purpose of this plan is to detail the controls that will be utilized for this construction in order to control sediment in the storm water runoff from the construction site drainage area.

Project Location: Fort Campbell Army Base

Fort Campbell, Kentucky

(PROJECT) (LOCATION)

Latitude - 36 38'10" North Longitude - 87 27' 40" East

(Values Approximate for Latitude - Longitude)

Constructed by: U.S. Army Corps of Engineers

Louisville District P.O. Box 59

Louisville, KY 40201-0059

Description of Site and Construction Activity: This construction is (INSERT DESCRIPTION).

The soil disturbing activity will consist of clearing and grubbing and demolition for the installation of the erosion and sediment control features, grade work, excavation for utilities, and parking lots. The sediment and erosion controls being utilized include straw bale dam, basket curb inlet, stone outlet sediment trap, fabric drop inlet protection, gravel donut inlet protection, construction entrance/exit, silt fence, and silt fence rock overflow, and temporary seeding and mulching. Clearing and grubbing must be held to a minimum necessary for grading and equipment operation.

Temporary seeding and mulching shall be deemed necessary if no construction activity occurs in the disturbed areas for more than fourteen (14) days. Construction must be sequenced to minimize the exposure time of cleared surface areas. Grading activities must be avoided during periods of highly erosive rainfall. Slopes of 2H:1V will be protected using and erosion control blanket. Other slopes that may be seeded and mulched may experience washout problems and require the use of an erosion control blanket. Contractor is to refer to manufacturer's recommendations for the type of erosion control blanket to be used on particular slopes.

Runoff Coefficient: The present runoff coefficient for the site is approximately 0.6 to 0.75. The development of the site will not significantly increase this coefficient. Developed coefficient is approximately (INSERT COEFFICIENT).

Receiving Waters: The water for the disturbed areas will pass through erosion control then into the storm system. The storm system for the majority of the site empties into (**LOCATION**).

#### **Erosion and Sediment Controls:**

STABILIZATION PRACTICES	STRUCTURAL PRACTICES		
Permanent Seeding	Straw Bale Dam Gravel Donut Inlet		
Mulching	Basket Curb Inlet	Protection	
	Stone Outlet Sediment	Temporary Construction	
	Trap	Entrance/Exit	
	Fabric Drop Inlet	Silt Fence	
	Protection	Silt Fence Rock Overflow	

2.1.2.2 Contracting Officer shall provide Environmental Plan for review to Environmental Division, Pollution Protection Branch.

#### 2.2 ANTICIPATED SEQUENCE OF ACTIVITY:

Place erosion control measures in locations in close proximity to those shown on the drawings. Additional erosion control measures may be required to comply with the NPDES permit once demolition and construction begins.

Surface water flowing toward the construction area will be diverted around the construction area to reduce its erosion potential. Silt fence, sediment traps or straw bale check dams shall be properly constructed to detain runoff and trap sediment.

Construct new site amenities including utilities, buildings, parking areas, and sidewalks after completing the necessary demolition.

Landscape and grade remaining areas according to the drawings.

Upon completion, remove any temporary measures not necessary for future phases of the project after stabilization of the area. Any sediment removed from these measures shall be disposed of at a time and location designated by the Contracting Officer. Any other areas disturbed during the removal of the sediment control structures shall be seeded and mulched within 24 hours.

NOTE: The Contractor controls the actual sequence, however, the sediment control measures must be established prior to initiation of work in any area. Contractors for Phased projects will be required to coordinate this work and interface Pollution Prevention Plans to ensure compliance with the intent of the Pollution Control Plans and to maintain continuous pollution prevention. Construction should be staged or phased for this project. Areas of one phase should be stabilized before other phases are initiated. Stabilization shall be accomplished by temporarily or permanently protecting the disturbed soil surface from rain fall impacts and runoff.

#### 2.3 DEMONSTRATION OF COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

All activities constructed under this contract will be performed in accordance with Federal, State and Local regulations. The construction contractor's specifications require compliance with all applicable regulations.

#### 2.4 POLLUTION PREVENTION PLAN AND NOTICE OF INTENT

The Contractor will implement the Pollution Prevention Plan (PPP) as shown on the plans and directed in these specifications. This plan must be implemented in accordance with the NPDES permit. A Notice of Intent (NOI) will be prepared by the U.S. Army Corps of Engineers and submitted to the state of Tennessee (KENTUCKY) fourteen (14) days prior to the notice to proceed being issued. The NOI Contractor Consent form for Tennessee (KENTUCKY) must be signed by the Contractor. A blank **Contractor's Signature Form** is attached at the end of this section. The Contractor shall maintain a copy of the PPP in their construction trailer. Any changes made to the plan must be documented and approved by the Contracting Officer.

#### 2.5 INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction:

These are examples of materials that could be Hazardous Materials and an inventory must be kept using Ft. Campbell's Hazardous Material Form attached. This list is not comprehensive but for illustration only. The Contractor must maintain and update a Hazardous Material list and inventory forms.

Concrete	Fertilizer	Detergents	Paints (Enamel and Latex)
Cleaning Solvents	Wood	Sealants	Metal Rebar/Structural Steel
Concrete Additives	Tar	Asphalt	Petroleum Based Products

#### 2.6 SPILL PREVENTION

The following are the material management practices to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

# 2.6.1 Good Housekeeping

- a. An effort will be made to store only enough product required to perform the task. Storage shall meet Federal, State and Local regulations to include 150 % containment of bulk storage over 19 liters.
- b. All materials stored onsite will be stored in a neat and orderly manner in their appropriate containers and properly labeled. When possible, material should be stored under a roof or in an enclosed area. If this is not possible, material will be covered with a tarpaulin or suitable replacement to prevent direct contact between storm water and the materials. All runoff from the storage area will be routed through a control structure.
- c. Products will be kept in their original containers with the original manufacturer's label.
- d. Substances will not be mixed with one another unless recommended by the manufacturer.
- e. Whenever possible, all of the product will be used up before disposing of container.
- f. Manufacture's recommendations for proper use and disposal will be dictated by Federal, State and Local regulations. Manufacturer's recommendations may be followed if as stringent or more than Federal, State and Local.
- g. The contractor will conduct daily inspections to ensure proper use and disposal of materials onsite.

#### 2.6.2 Hazardous Products

These practices are used to reduce the risks associated with hazardous materials and must be incorporated into the Pollution Prevention Plan:

- a. Products will be kept in their original containers unless they are not resealable.
- b. Original labels and material safety data will be retained they contain important product information.
- c. All containers will have the Diamond label affixed per the National Fire Prevention Associations Publication 704.
- d. Disposal of surplus product will be performed as recommended by the manufacturer or as required by State and Local regulations.

#### 2.7 SPILL PREVENTION PRACTICES

In addition to good housekeeping and material management practices discussed in the previous sections of this plan, a Site Specific Spill Contingency Plan must be prepared by the Contractor and submitted to Fort Campbell Environmental Division. The SSSCP must be developed as outlined in the Fort Campbell Environmental Handbook. Guidance and instructions for preparation of the <a href="SITE SPECIFIC SPILL">SITE SPECIFIC SPILL</a> CONTINGENCY PLAN (SSSCP) are included at the end of this section. In addition to the requirements of the SSSCP, the following practices must be followed by the Contractor for spill prevention and clean up:

- a. Materials and equipment necessary for cleanup will be kept in the material storage area. There will be enough equipment to supply at least three (3) men. Equipment and materials will include but not be limited to; brooms, dust pans, mops, rags, gloves, goggles, absorbing compound, and plastic and metal trash containers specifically for this purpose.
- b. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of information and cleanup supplies.
- c. All spills will be cleaned up immediately after discovery. Disposal of the waste from the spill shall be at the Contractor's expense and shall be coordinated with the Pollution Prevention Branch before removal or disposal.
  - d. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
  - e. All spills of toxic or hazardous materials will be reported to the Ft. Campbell Fire Department and DPW Environmental through the Contracting Officers Representative who will report to the appropriate State or Local government agency if necessary.
  - f. Once a spill has occurred, the spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring with a discussion of the appropriate cleanup for that type of spill. Also, a description of the spill, what cleaned it, and the cleanup measures will be included.
  - g. The prime Contractor will be responsible for the day-to-day site operations, including spill prevention and will designate an employee, by name, to be the primary cleanup coordinator. Each subcontractor bringing more than 75 liters or 68 kilograms of a spillable substance shall also designate a cleanup coordinator. The cleanup coordinators will designate three (3) additional site personnel for spill prevention and cleanup.
  - h. Everyone will be trained in spill prevention and cleanup and shall know the primary cleanup coordinator and any additional site personnel to contact. Fort Campbell's Environmental Handbook (excerpt included below) will be the basis for spill prevention training.

Section: Appendix DD W912QR-234

### (TAKEN FROM)

# FORT CAMPBELL ENVIRONMENTAL HANDBOOK Guidance and Instruction SPILL PLANNING AND RESPONSE

Spill response equipment is a critical component of an effective response to an unexpected release of hazardous materials. Making an inventory of potential spots for emergency releases and having appropriate and sufficient spill response equipment to deal with those potential releases is required for each unit. Attachment 1 provides spill response materials minimum requirements.

# SPILL PLANNING AND RESPONSE TRAINING REQUIREMENTS:

- 1) All personnel involved with the management and handling of oil and hazardous materials must be periodically trained in spill prevention and response. The training will be similar to the Hazardous Communication Program Worker Right to Know and will include the following key features:
  - a) Health effects of exposure to oil or hazardous materials;
  - b) Applicable first aid procedures to be used following exposure;
  - c) Personal Protective Equipment requirements and procedures for using equipment;
  - d) Evacuation procedures;
  - e) Spill material combustibility and potential for flash-back along vapor trails;
  - f) Fire fighting procedures and special hazards of combustible products;
  - g) Reactivity of spill material with common materials including water;
  - h) Use and maintenance of all alarms and monitoring equipment associated with spill prevention or response;
  - Initial Notification procedures;
  - j) Site specific contingency plans;
  - k) Location of posted Site Specific Spill Contingency Plan;

- Immediate spill response actions including location of pump controls and valves to stop spill flow; location and use of fire extinguishers, absorbents, neutralizing agents and other immediate spill response procedures;
- m) Visual inspections requirements of the particular areas; and
- n) Purpose and requirements of good housekeeping.
- 2) Spill response training exercises will be conducted once per year for personnel working at oil and hazardous material sites. Personnel entering one of these positions will be trained within two weeks after starting work and after any significant changes to the spill plan or training program. Records of the type, extent, and frequency of each individual's training will be maintained until closure of the applicable area or until three years after the date the individual last worked in the area. Refresher training shall be given with the Toolbox Safety Meetings and documented on the Quality Control Reports. Training shall cover what to do, and who to contact in case of a spill and what emergency action must be taken if any.

#### SPILL RESPONSE IS HANDLED BY FOUR DISTINCT OPERATIONS:

# a) SPILL REPORTING

The first action to be taken in the event of a spill is to report the spill. If you observe a release of a hazardous material, report it to your supervisor and the Fire Department as required below. If the spill is in a Training Area, then the spill will be reported to Range Control, who will then notify the Fire Department. The Fire Department will notify DPW Environmental Division and if required, Installation Safety, Emergency Medical, and Preventative Medicine. The DPW Environmental Division does all reporting to State/Federal Agencies.

The Fire Department (or Range Control) must be promptly notified of any of the following spills:

- (1) Any uncontrolled quantity of a hazardous substance, or if assistance is needed by Fire Department or Environmental Division, or as instructed by the MSDS or supervisor's discretion.
- (2) Oil and other petroleum products with quantity exceeding 10 gallons or area of spill greater than two feet in any direction or any amount that has spilled into a stream or body of water.

Environmental Division review has determined the material(s) listed requires special reporting at the quantity shown: (To be supplied by environmental staff during plan review.)

#### b. STOP OR CONTAIN THE SPILL

Assess the situation before attempting to contain any hazardous material spilled and proceed only if it is safe to do so. You must have knowledge of the spilled substance and don any required personal protective equipment. If necessary, make the spill scene off limits to any unauthorized personnel. If situation warrants, evacuate the area.

#### c. CLEAN UP THE SPILL

Under no circumstances should untrained and/or ill-equipped persons attempt to perform cleanup. In some instances, spill cleanup may require respiratory protection and other personal protective equipment. If it is within the capability of the unit that caused the spill, then that unit is responsible for its cleanup. Environmental Division will make the decision to obtain assistance and coordinate with other units as required. If you handle/work with the hazardous material as part of your job, you are to be trained and qualified to participate in the cleanup of the spill. All contractors must have an OSHA 1910.120 qualified spill response contractor available to respond to spills in 4 to 6 hours that require heavy equipment to remove contaminated soils/absorbents. Spill that cannot be removed because of response delays may need to be covered with heavy plastic and or secured to prevent further spread of contamination.

#### d. DISPOSE OF SPILLED HAZARDOUS MATERIAL.

All spilled material and other contaminated material (soil, gravel, absorbents, etc.) must be properly disposed. It is the responsibility of the contractor that created the spill to properly package, dispose of the waste, and ensure the site is properly cleaned at no cost to the government. Some spill incidents may require cleanup, disposal, soil testing and a site closure report by an approved licensed environmental contractor approved by Fort Campbell. Environmental Division will determine the required cleanup and disposal method.

#### 2.8 PRODUCT SPECIFIC PRACTICES

The following product specific practices will be followed on-site:

- a. Petroleum Products All vehicles will be periodically inspected for leaks and shall receive regular preventative maintenance to reduce the chance of leaks occurring. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Bulk storage areas will be equipped with secondary containment appropriate for risk of loss from the primary container (s). Storage shall meet Federal, State and Local regulations. Secondary containment shall hold 150 % of the bulk amount stored over 19 liters. The Contractor will maintain a specific spill contingency and countermeasures plan for use in a bulk storage area.
- b. Fertilizer Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. The contents of any partially used bags of fertilizer will be transferred to a sealable container to avoid spills.

c. Paints, Solvents, and Sealants - All containers will be tightly sealed and kept in the storage area when not in use. Any excesses of these materials will not be discharged into the storm sewer system, but will be properly disposed of according to manufacturer's instructions or State and Local regulations.

d. Concrete Trucks - Concrete trucks will be allowed to wash out, discharge surplus concrete and drum wash water only in a designated area. All wash water from the concrete trucks must be retained on-site and treated according to Federal, State and Local regulations. Upon completion of the job, all discharges of surplus concrete and any soil contaminated by the concrete wash water will be removed from the site and taken to an approved disposal area. Water with the potential of entering sink holes or storm sewers will not be allowed to be discharged.

#### 2.9 INSTALLATION/CONSTRUCTION

#### 2.9.1 Inlet Protection

#### 2.9.1.1 Fabric Drop Inlet Protection

- a. Construct a dike on the downslope side of the inlet to prevent runoff from bypassing. Dike should be 150 mm higher than inlet protection.
- b. Cut fabric from a single roll to avoid joints.
- c. Construct the fence as shown on in the drawings.
- d. Space the support posts evenly against the inlet perimeter a maximum of one (1) m apart, and drive them about 0.5 m into the ground.

#### 2.9.1.2 Gravel Donut Inlet Protection

- a. Construct a dike on the downslope side of the inlet to prevent runoff from bypassing. Dike should be 150 mm higher than inlet protection.
- b. Construct as shown in the drawings.

#### 2.9.1.3 Basket Curb Inlet

- a. Install immediately after a new inlet is placed or on existing inlets, before any land disturbing activity.
- b. If necessary, adapt basket dimensions to fit inlet box dimensions, see drawings.
- c. Remove the grate and place basket in the inlet.
- d. Cut and install a piece of filter fabric large enough to line the inside of the basket and extending a minimum of 150 mm beyond the frame.
- e. Replace the inlet grate, which also serves to anchor the fabric.

#### 2.9.2 Silt Fence and Silt Fence Rock Overflow

- a. Construct as shown on the drawings.
- b. Staked and entrenched straw bales must be installed along the base of all fills and cuts and on the downhill sides of stockpiled soil.

#### 2.9.3 Straw Bale Dam

- a. Construct as shown on the drawings.
- b. Staked and entrenched straw bales must be installed along the base of all fills and cuts and on the downhill sides of the stockpiled soil.

# 2.9.4 Seeding

- a. Test soil to determine its nutrient level or apply a 12-12-12 fertilizer at a rate of 75 to 110 kilograms per hectare.
- b. Work fertilizer into the soil 50 mm 100 mm deep with a disk or rake operated across the slope.
- c. Select a seed mixture and application rate that best suits the soil type and climate. Also, consult the county soil, water conservation office for assistance.
- d. Apply seed uniformly with a drill or cultipacker seeder, or by broadcasting, and cover to recommended depth.
- e. If drilling or broadcasting, firm the seedbed with a roller or cultipacker.

f. Mulch seeded area to increase seeding success.

# 2.9.5 Mulching

- a. Apply at the recommended rate based on the material being used.
- b. Spread uniformly with no more than 25% of the ground surface visible.
- c. If straw or hay is used, it must be anchored immediately.

#### 2.10 INSPECTION AND MAINTENANCE

All measures that are being utilized will be inspected at least once each week and after each storm event. An inspection report shall be written after each inspection and submitted to the Contracting Office representative within 24 hours. Once a problem is found or sediment has reached the clean-out elevation, corrective action shall commence within 24 hours. Inspections shall continue until the controls are removed or the vegetative cover is firmly established.

#### PART 3 EXECUTION

#### 3.1 GENERAL

The Contractor shall perform all work in such manner as to minimize the pollution of air, water, or land, and shall, within reasonable limits, control noise and the disposal of solid waste materials, as well as other pollutants. Information contained in the following specifications should also be referenced:

Section 02050 Demolition

Section 02080 Removal and Disposal of Asbestos Containing Materials

Section 02090 Demolition or Buildings with Lead Containing Paint and Disposal of

Lead-Based Paint

#### 3.2 IMPLEMENTATION

Within 10 calendar days after Notice to Proceed and prior to commencement of the work at the site, the Contractor shall meet the representatives of the Contracting Officer to review and alter his proposal as needed for compliance with the environmental pollution control program.

#### 3.3 PROTECTION OF LAND AREAS

Except for any work on storage areas and access routes specifically assigned for the use of the Contractor under this contract, the land areas outside the limits of permanent work performed under this contract shall, in accordance with CONTRACT CLAUSE: PROTECTION OF EXISTING VEGETATION, STRUCTURE, UTILITIES AND IMPROVEMENTS, be preserved in their present condition. Contractor shall confine his construction activities to areas defined for work on the plans or specifically assigned for his use. In accordance with CONTRACT CLAUSE: OPERATIONS AND STORAGE AREAS, storage and related areas and access routes required temporarily by the Contractor in the performance of the work will be assigned by the Contracting Officer. No other areas on Government premises shall be used by the Contractor without written consent of the Contracting Officer.

#### 3.4 PROTECTION OF TREES AND SHRUBS

CONTRACT CLAUSE: PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES AND IMPROVEMENTS, is hereby supplemented as follows: The Contractor shall not deface, injure or destroy trees or shrubs, nor remove or cut them without special authority. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage.

#### 3.4.1 Tree Protective Structures

Where, in the opinion of the Contracting Officer, trees may possibly be defaced, bruised, injured or otherwise damaged by the Contractor's equipment or by his other operations, he may direct the Contractor to provide temporary protection of such trees by placing boards, plans, or poles around them.

# 3.4.2 Restoration of Damaged Trees

Any tree scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. All scars made on trees not designated on the plane to be removed by construction operations shall be coated as soon as possible with an approved tree wound dressing. Trees that are to remain, either within or outside established clearing limits, that are damaged by the Contractor so as to be beyond saving in the opinion of the Contracting Officer, shall be immediately removed, if so directed, and replaced with a nursery-grown tree of the same species and size.

#### 3.5 PROTECTION OF WATER RESOURCES

The Contractor shall control the disposal of fuels, oils, bitumen, calcium chloride, acids, or harmful materials, both on and off the Government premises, and shall comply with applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams while performing work under this contract. The contractor should note that the entire cantonment area is within the delineated Well Head Protection Area for Fort Campbell. This means any release in this area has the potential, due to the installations geological features to impact their drinking water source. For this reason special measures need to be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides

and insecticides from entering public waters or potentially migrating via sinkholes or other karst related geologic features to drinking water sources. Special measures will include the generation of a site-specific Spill Prevention Control and Countermeasures Plan. Water used in onsite material processing, concrete curing, foundation and concrete cleanup, and other waste waters shall not be allowed to reenter a stream if an increase in the turbidity of the stream could result there from.

#### 3.6 BURNING

Air pollution restrictions applicable to this project are as follows. Materials shall not be burned on the Government premises. If the Contractor elects to dispose of waste materials off the Government premises, by burning, he shall make his own arrangements for such burning area and shall, as specified in CONTRACT CLAUSE: PERMITS AND RESPONSIBILITIES, conform to all local regulations.

#### 3.7 DUST CONTROL

The Contractor shall maintain all excavations, stockpiles, access roads, waste areas, and all other work areas free from excess dust to such reasonable degree as to avoid causing a hazard or nuisance to the Using Service or to others. Approved temporary methods consisting of sprinkling, chemical treatment, or similar methods will be permitted to control dust. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

#### 3.8 EROSION CONTROL

Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall be graded to control erosion within acceptable limits. Temporary control measures shall be provided and maintained until permanent drainage facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum.

#### 3.9 CORRECTIVE ACTION

The Contractor shall, upon receipt of a notice in writing of any noncompliance with the foregoing provisions, take immediate corrective action. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs of damages by the Contractor unless it was later determined that the Contractor was in compliance.

### 3.10 POST-CONSTRUCTION CLEANUP OR OBLITERATION

In accordance with CONTRACT CLAUSE: CLEANING UP, the Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed areas shall be graded and filled and the entire area seeded.

# 3.11 PAYMENT

No separate payment or direct payment will be made for the cost of the work covered under this section, and such work will be considered as a subsidiary obligation of the Contractor.

-- END OF SECTION -

**Return to Table of Contents** 

# **FTCKY HAZMAT INVENTORY FORM**

Date:/	Ft. Campbell Environmental Di	Ft. Campbell Environmental Division/Pollution Prevention Branch/ 798-3105		
Unit (Bde, Bn, Co.):	Bldg #: S	State: POC Name:		Phone #:
Bldg Description:	(i.e. motor pool, aviation hangar, supply room, etc.)	HazMat Storage Location:	(i.e. flammable wall locker, supply closet, etc.)	

#### Updated 3/25/98

NSN (If unknown, attach MSDS)	Manufacturer	Material Name	Material Use	Expire Date	Disposal Procedure	Containers On Hand	Weight or Volume Per Container	Amount Used Per Month (Approximate)
Example: 6810-00-281-2785	CSD Inc.	MEK	Degreaser	12-99	Hazardous Waste Disposal	1 Can	1 Gal.	1Gal.

# Construction Activity Water Permitting Requirements Contractor's Signature Form

Section: Appendix DD

State of Tennessee Department of Environment and Conservation Rule 1200-4-10.05 Division of Water Pollution Control NPDS General Permit TNR 100000 To be completed by developer: NOI Submission Date:\_\_\_\_\_ Project Name: Project Location: County I have agreed to perform construction-related professional services, described as: that will likely impact the nature of storm water runoff from the named construction activity. Erosion control services involve primarily: \_ Prepare erosion control plan \_\_\_\_ Inspection of controls \_\_ Install, maintain erosion and sediment controls Other I understand the terms and conditions of Rule 1200-4-10.05 and that I, and my company, as the case may be, are responsible for the legally liable for complying with this Rule and the applicable State and Federal Laws. I understand that State or EPA or private actions may be taken against me if the terms and conditions of the Rule are not met. Printed Name:\_\_\_\_\_ Title:\_\_\_\_ \_\_\_\_\_ Date:\_\_\_\_ Company Name:\_\_\_ Address:\_\_\_\_\_ City:\_\_\_\_\_ State:\_\_\_\_ Phone No.\_\_\_\_\_ Field Person in charge: Phone No. Owner/Developer: I certify that the above has been retained to perform the described construction related services noted above and as outlined in the referenced NOI. \_\_\_\_\_ Date:\_\_\_\_ Signature:\_\_\_\_\_

-- End of form --

**Back to Paragraph 2.4** 

August 17, 1998

# FORT CAMPBELL CONTRACTOR SITE SPECIFIC SPILL CONTINGENCY PLAN

CONTRACT NUMBER:  GENERAL DISCRIPTION OF WORK:				
1.	RESPONSIBLE PERSONS			
A.	PRIMARY PERSON Name: Home Phone:	TITLE:		
	ALTERNATE PERSON Name: Home Phone:	TITLE:		
C.	SECOND ALTERNATE PERSON Name:Home Phone:	TITLE:		
]	SPECIAL PRECAUTIONARY MEASURES FOR B If more than one building, Specify hazardous mat Building (S) #	terials for those buildings.		
	Avoid contacts with spilled substances.  Refer to Material Safety Data Sheets (MSDS) for part handling and spill procedures. Flammable materials w material safety data sheets. If needed, list any m precautionary measures.	will be extinguished as to local fire regulations and	d the	
			_	

3. EMERGENCY SPILL EQUIPMENT ON HAND (For example, sweeping compound and absorbent material, brooms and plastic dust pans, emergency spill kits, non-sparking shovels, other items as needed and required) BUILDING#: BUILDING#: 4. HAZARDOUS MATERIAL AND QUANTITY NORMALLY ON HAND A. Attach a listing of Hazardous Materials on hand, using the FTCKY HAZMAT Inventory Form. **B.** Material Safety Data Sheets are readily available and located at (the specific location is required). Bldg. #:\_\_\_\_\_ 5. SPILL RESPONSE AND NOTIFICATION PROCEDURES A. REPORT THE SPILL. The first action in the event of a spill is to report the spill. If you observe a release of a hazardous material, report it to your supervisor and the Fire Department as required below. If the spill is in a Training Area, then the spill will be reported to Range Control, who will then notify the Fire Department. The Fire Department will notify Environmental Division and, if required, Installation Safety, Emergency Medical, and Preventative Medicine. The Environmental Division does all reporting to State/Federal Agencies. The Fire Department (or Range Control) must be promptly notified of any of the following spills: Any uncontrolled quantity of a hazardous substance, or if assistance is needed by Fire Department or Environmental Division, or as instructed by the MSDS or supervisor's discretion: Oil and other petroleum products with quantity exceeding 10 gallons or area of spill greater than two feet in any direction or any amount that is spilled into a stream or body of water. Environmental Division review has determined the material(s) listed requires special reporting at the quantity shown: (To be supplied by environmental staff during plan review.) Name: \_\_\_\_\_ Quantity \_\_\_\_\_ Name: \_\_\_\_\_ Quantity \_\_\_\_\_

Section: Appendix DD

Name: \_\_\_\_\_ Quantity \_\_\_\_\_

Section: Appendix DD W912QR-23413770 CERTIFIED FINAL-003 Page 603 of 947

NAME:	TITLE:
WORK PHONE:	TITLE: HOME PHONE:
FIRE DEPARTMENT: phone 911	
RANGE CONTROL: phone (270) 7	98-3001 or on radio frequency FM 49.95
ENVIRONMENTAL phone (270)	798-3105
1. If required by your <b>ORGANIZATION</b> required, fill in N/A.	I, additional people to be notified within your chain of command: In
ALTERNATE PERSON	
NAME:	RANK:
WORK PHONE:	HOME PHONE:
ALTERNATE PERSON	
NAME:	RANK:
WORK PHONE:	HOME PHONE:
The spill report must include the following Name/Phone/Unit of individual	llowing information: reporting the spill;
	ber, etc.);
Name of spilled material;	
Extent of spill, including drainag	e features;
Injuries, if any;	
Time spill occurred;	

#### B. STOP OR CONTAIN THE SPILL.

Assess the situation before attempting to contain any hazardous material spilled and proceed only if it is safe to do so. You must have knowledge of the spilled substance and don any required personal protective equipment. If necessary, make the spill scene off limits to any unauthorized personnel. If situation warrants, evacuate the area.

#### C. CLEAN UP THE SPILL.

Under no circumstances should untrained and/or ill-equipped persons attempt to perform cleanup. In some instances, spill cleanup may require respiratory protection and other personal protective equipment. If it is within the capability of the unit that caused the spill, then that unit is responsible for its cleanup. Environmental Division will make the decision to obtain assistance and coordinate with other units as required.

If you handle/work with the hazardous material as part of your job, you are to be trained and qualified to participate in the cleanup of the spill.

#### D. DISPOSE OF SPILLED HAZARDOUS MATERIAL.

All spilled material and other contaminated material (soil, gravel, absorbents, etc.) must be properly disposed. It is the responsibility of the unit that created the spill to properly package and dispose of the waste. Environmental Division will determine the required disposal method.

# **Responsible Person Signature and Date**

**Return to Table of Contents** 

Return to Chapter 2, Para 2.7

# SECTION 01 57 23 Temporary Storm Water Pollution Control

# Ft. Campbell Requirements:

Ft. Campbell special requirements apply Section 01 57 23 for <u>all</u> COE and DPW prepared projects.

### **Instructions to Designers:**

Project plans and specifications shall include guidance and requirements contained in **Erosion and Sedimentation Control**:

Additional required guidance is found in Chapter 2.

For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

# **SECTION 01 74 19 Construction and Demolition Waste Management**

# Ft. Campbell Requirements:

Practices shall apply to all construction and demolition activities at Fort Campbell. Contract specifications shall require at least a 50% diversion of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. See Chapter 2, Paragraph 2.1.4 (Click here). Diversion can be

accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post.

Demolition materials shall not be salvaged by the contractor and shall not be removed from the installation. Non salvageable demolition materials shall not to be transported off the installation.

Notify the DPW Environmental Division if unknown waste is discovered during site investigations. Waste could be explosive, hazardous or toxic waste.

Dumpster service for new construction and for demolition is not provided by the installation. The contractor shall arrange for dumpster service at the Contractor's own expense.

In general, utilities are not to be abandoned in place; all abandoned utilities are to be removed. There are circumstances where this requirement does not apply. Abandonment of utilities and removal shall be a topic of discussion at design conferences.

# **Instructions to Designers:**

- Modify UFGS 01 74 19 paragraphs to include the building demolition/diversion requirements above and modify contract specifications.
- 2 Construction specifications shall require a Building Materials Diversion Plan to be submitted and approved by DPW.
- When a project requires removal/disposal of environmentally hazardous waste generated at Fort Campbell, the DPW Environmental Division must be involved in the permitting process. Modify project drawings and specifications paragraphs to include each of the above features as they apply to the project. Additional guidance on Environmental Requirements and Hazardous Waste Disposal Practices is contained in <a href="#Appendix A">Appendix A</a>, and project specifications shall be modified to indicate these requirements.
- For mercury containing light bulb disposal, insert the Mercury Light Bulb paragraph.

**Return to Table of Contents** 

CHAPTER 3
Technical Requirements and Instructions
Division 02
Existing Conditions

69

# SECTION 02 41 00 Demolition and Deconstruction

# Ft. Campbell Requirements:

Practices shall apply to all construction and demolition activities at Fort Campbell. Contract specifications shall require at least a 50% diversion (by weight) of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill (See Chapter 2, para 2.1.4 (Click here)). Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post.

Requirements in this section and Appendix A-10. <u>National emission standards for hazardous air pollutants (NESHAP)</u> regulatory requirements for demolition apply.

Demolition materials shall not be salvaged by the contractor and shall not be removed from the installation. Non-salvageable demolition materials shall not be transported off the installation.

Notify the DPW Environmental Division if unknown waste is discovered during site investigations. Waste could be explosive, hazardous or toxic waste.

Dumpster service for new construction and for demolition is not provided by the installation. The contractor shall arrange for dumpster service at the Contractor's own expense.

In general, utilities are not to be abandoned in place; all abandoned utilities are to be removed. There are circumstances where this requirement does not apply. Abandonment of utilities and removal shall be a topic of discussion at design conferences.

# Instructions to Designers:

- 1 Modify UFGS 02220 paragraphs to include the building demolition/diversion requirements above and modify contract specifications.
- 2 Construction specifications shall be modified to require a Building Materials Diversion Plan to be submitted and approved by DPW.
- When a project requires removal/disposal of environmentally hazardous waste generated at Fort Campbell, the DPW Environmental Division must be involved in the permitting process. Modify project drawings and specifications paragraphs to

include each of the above features as they apply to the project. Additional guidance on Environmental Requirements and Hazardous Waste Disposal Practices is contained in <a href="Appendix A">Appendix A</a>, and project specifications shall be modified to indicate these requirements.

- A National emission standards for hazardous air pollutants (NESHAP) regulatory requirements for demolition apply for asbestos abatement. In addition NESHAP notification is also required even if the operation involves removal of "non-regulated" ACM in any amount, OR even if the operation involves no asbestos removal whatsoever. See this EPA site for specific items covered. When NESHAP items are encountered, project demolition specifications shall be modified to include the requirements identified in Appendix A.
- For mercury containing light bulb disposal, insert the Mercury Light Bulb paragraph.

**Return to Table of Contents** 

# SECTION 02 42 91 Removal and Salvage of Historic Building Materials

# Ft. Campbell Requirements:

#### **Historic District:**

The "Clarksville Base" portion of Ft. Campbell cantonment area is eligible for the National Register of Historic Places as a significant Cold War historic district. Designers are required to consult with the State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation for any projects that are sited at the Clarksville Base. POC is DPW Environmental Division Cultural Resource Manager at 270-798-7437.

# Instructions to Designers:

1. Complete the requirements as they apply to specific projects.

**Return to Table of Contents** 

# SECTION 02 82 16.00 20 Engineering Control of Asbestos Containing Materials

# Ft. Campbell Requirements:

Removal and disposal of asbestos containing materials shall be conducted in accordance with Ft. Campbell specification section 02 82 16.00 20, Engineering Control of Asbestos Containing Materials, which shall be included in all projects containing or possibly containing Asbestos products.

Friable and non-friable asbestos containing materials are to be removed from buildings before demolition. Abatement contractors are to notify the TSCA program in writing at least two days prior to beginning asbestos removal. The point of contact for this notification is Russ Godsave at (270) 798-9637.

Contractors must abide with the asbestos regulations in order for the asbestos to be accepted at the Woodlawn Landfill. These procedures include proper notification, manifesting, documentation, vehicle marking, unloading and PPE.

Many contractors depend on refuse contractors to transport the asbestos waste, and their personnel accompanying the asbestos do not normally have asbestos knowledge or training. Therefore, those delivering the materials to the landfill must have proof of medical surveillance and proper PPE.

# Instruction to Designers:

- Asbestos studies have been completed for numerous existing buildings and facilities at Fort Campbell. Designers shall investigate and review the data as required to insure proper identification and notification of asbestos presence at planned OMA and MILCON projects. These studies are available for inspection at the DPW Maintenance Division. POC is DPW, Engineering Branch Chief at 270-956-7213.
- 2. All projects containing or possibly containing Asbestos products shall include Fort Campbell specification section 02 82 16.00 20, Engineering Control of Asbestos Containing Materials
- 3. Additional Environmental guidance applies. See Appendix A.
- **4.** For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM

# Ft. Campbell Specification

### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred in the text by basic designation only.

# AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) PUBLICATIONS:

ANSI Z9.2-79 Fundamentals Governing the Design and Operation

of Local Exhaust Systems

# CODE OF FEDERAL REGULATIONS (CFR) PUBLICATIONS:

40 CFR 61, Subpart A	General Provisions
40 CFR 61, Subpart M	National Emission Standard for Asbestos
40 CFR 241	Guidelines for the Land Disposal of Solid Wastes
40 CFR 257	Criteria for Classification of Solid Waste Disposal Facilities and Practices
29 CFR 1926.1101	OSHA Construction Industry Asbestos Standard
29 CFR 1910.120	OSHA Hazardous Waste Emergency Response
29 CFR 1910 subpart I	OSHA Personal Protective Equipment Standard
NATIONAL INSTITUTE	OF OCCUPATIONAL SAFETY AND HEALTH
Method 7400	Manual of Analytical Methods, 3rd Ed.,Vol. 1, Physical and Chemical Analysis Method (P&CAM)Fibers
Method 7402	Asbestos Fibers
UNDERWRITERS LA	BORATORIES, INC. (UL) PUBLICATIONS
UL 586	1986 High Efficiency Particulate, Air Filter

Sta

#### 1.2 DESCRIPTION OF WORK

The work covered by this section includes the handling of friable and nonfriable asbestos containing materials (ACMs) which may be encountered during removal and demolition operations and the incidental procedures and equipment required to protect workers and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of the removed asbestos-containing materials. Perform work in accordance with 29 CFR 1926.1101; 40 CFR 61, Subpart A; 40 CFR 61, Subpart M; and the requirements specified herein.

Please refer to pages B20-B38 of the Detail drawings, Volume 1 of 7 for specific locations and quantities of asbestos containing materials.

Please see drawing TU 1.0 for locations of underground chilled water lines, steam lines and condensate lines which are insulated with asbestos containing materials. A total of 6002 linear feet (1850m) are assumed to be present. The breakdown of the piping is as follows:

```
100 mm (4") chilled water supply - 425 m (1361 ft)
100 mm (4") chilled water return - 425 m (1361 ft)
150 mm (6") steam - 350 m (1148 ft)
125 mm (5") steam - 150 m (492 ft)
80 mm (3") condensate - 250 m (820 ft)
50 mm (2") condensate - 250 m (820 ft)
```

In addition two cooling towers located at buildings 6775 and 6781 are composed of transite panels and have interiors that contain a honey combed fill material which contains asbestos. An estimated total of 160 square feet of asbestos containing materials are present in each of the two units.

### 1.2.1 Asbestos Survey

An asbestos Survey was conducted in the contract work area(s) to identify the presence of asbestos containing materials as described in 1.2 above. The data collected is contained in the Asbestos and Lead-Based Paint Survey Report for the Third Brigade Barracks, Fort Campbell, Kentucky, prepared by Gobbel Hays Partners, which is on file at the Fort Campbell PW, Environmental Division. Contact must be made through the Contracting officer.

#### 1.2.2 Unidentified ACM

If suspect ACM not covered by the drawings or the specifications is encountered, the contractor will stop work and immediately notify the contracting officer. Upon direction from the contracting officer, the contractor may be required to conduct sampling and

testing of these suspect materials in accordance with the Industrial Hygienist's recommended procedures.

#### 1.3 DEFINITIONS

# 1.3.1 Aggressive method

Removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact Asbestos Containing Material (ACM).

## 1.3.2 Amended Water

Water containing a wetting agent or surfactant.

## 1.3.3 Area Monitoring

Sampling of asbestos fiber concentrations inside and out of the regulated area, which is representative of the airborne concentrations of asbestos fibers which may reach the breathing zone.

## 1.3.4 Asbestos

Includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, actinolite, and any of these minerals that have been chemically treated and/or altered. For purposes of this standard, "asbestos" includes PACM, as defined below.

## 1.3.5 Asbestos Abatement Contractor

A business entity certified, licensed, or accredited by the state in which a response action involving asbestos-containing building material that is friable, or expected to become friable during the response action.

## 1.3.6 Asbestos Containing Material (ACM)

Any material containing more than one percent asbestos

## 1.3.7 Asbestos Fibers

Asbestos fibers having a length-to-diameter ratio of at least 3 to 1 and a length of 5 micrometers or longer as counted in the NIOSH Method 7400 or Method 7402 procedure using either phase contrast light microscopy (PCM) or transmission electronic microscopy (TEM).

## 1.3.8 Asbestos Permissible Exposure Limit (PEL)

Legally enforceable level of asbestos fibers in air set by the Occupational Safety and Health Association (OSHA),

as an eight (8) hour time weighted average (TWA) of asbestos fibers not to exceed 0.1 fibers per cubic centimeter of air as set forth in 29 CFR 1926 1101

#### 1.3.9 Authorized Person

Any person authorized and required by work duties to be present in regulated areas.

## 1.3.10 Breathing Zone

A hemisphere forward of the shoulders with a radius of approximately 6 inches to 9 inches.

# 1.3.11 Category I Nonfriable ACM

Category I Nonfriable ACM includes asbestos-containing packing, gaskets, resilient floor covering, and asphalt roofing products.

# 1.3.12 Category II Nonfriable ACM

Category II Nonfriable ACM includes any asbestos-containing material not included in Category I that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

## 1.3.13 Certified Asbestos Supervisor

One certified by the State in which work is to be performed and has passed an examination covering "Supervision of Asbestos Abatement Projects" or similar title training. This training must be the equivalent in curriculum, training, method and length to the EPA Model Accreditation Program (MAP) asbestos abatement workers training 40 CFR part 763 subpart E, Appendix C.

#### 1.3.14 Certified Asbestos Worker

One certified by the National Asbestos Council and holds current cards illustrating the board number.

# 1.3.15 Certified Licensed Contractor

A Contractor who has been trained at an EPA approved course and certified/accredited by the state for which the work is to be performed in.

## 1.3.16 Certified Industrial Hygienist (CIH)

One certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

#### 1.3.17 Class I Asbestos Work

Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and PACM.

#### 1.3.18 Class II Asbestos Work

Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but it not limited to, the removal of asbestos-containing wallboard, floor tile, sheeting, roofing, siding shingles, and construction mastics.

## 1.3.19 Class III Asbestos Work

Repair and maintenance operations, where "ACM, including thermal system insulation and surfacing material, is likely to be disturbed.

## 1.3.20 Clean Room

An uncontaminated, transitional room having facilities for storage of employees' street clothing and uncontaminated materials and equipment.

# 1.3.21 Competent Person

In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure and has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f); in addition, for Class I and Class II work, one who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or supervisor, or its equivalent and, for Class II who is trained in an operations and maintenance (O&M) course developed by EPA (40 CFR 763 . 92 (a)(2)).

## 1.3.21 Critical Barrier

One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in work area from migrating to an adjacent area.

## 1.3.23 Decontamination Area

An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room which is used for the decontamination of workers, materials and equipment contaminated with asbestos.

#### 1.3.24 Demolition

The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

## 1.3.25 Disturbances

Contact which releases fibers from ACM or PACM or debris containing ACM or PACM. This term includes activities that disrupt the matrix of ACM or PACM, render ACM or PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event will the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which will not exceed 60 inches in length and width.

# 1.3.26 Employee Exposure

That exposure to airborne asbestos fibers that would occur if the employee were not using respiratory protective equipment.

#### 1.3.27 Encapsulant

A liquid material which can be applied to ACM which controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

# 1.3.28 Encapsulate

The process where by an encapsulant is applied to ACM to control the release of asbestos fibers into the air.

# 1.3.29 Equipment Room (Change Room)

A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

#### 1.3.30 Excursion Limit

The contractor will ensure that no employee is exposed to an airborne concentration of asbestos in excess 1.0 fibers per cubic centimeter of air (1.0 f/cc) as averaged over a sampling period of 30 minutes.

#### 1.3.31 Fiber

A particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.

## 1.3.32 Friable Asbestos Material

Material that contains more than one percent asbestos by weight which can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

# 1.3.33 Glovebag Technique

A method with limited applications for removing small sections of asbestos-containing material from HVAC ducts, short piping runs, valves, joints, elbows, and other nonplanar surfaces in a noncontained regulated area. The glovebag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the removal process. All workers who are permitted to use the glovebag technique must be highly trained, experienced and skilled in this method. Glovebag techniques must be performed in accordance with 29 CFR 1926.1101 which require at least two persons perform class I removals. Glovebags may not be moved along a piece of pipe.

# 1.3.34 Glovebag

An impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled. Glovebags will be made of 6 mil thick plastic and will be seamless at the bottom. Glovebags are for single use and must be smoke tested for leaks prior to usage.

# 1.3.35 HEPA Filter Equipment

High-efficiency particulate air (HEPA) filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining at least 99.97 percent of all mono-dispersed particles of 0. 3 micrometer diameter or larger.

## 1.3.36 Homogeneous Area

An area of surfacing material or thermal system insulation that is uniform in color and texture.

#### 1.3.37 Intact

ACM which has not been crumbled, pulverized, or otherwise deteriorated so that it is no longer likely to be bound with its matrix.

# 1.3.38 Negative Initial Exposure Assessment

A demonstration based by the contractor, which complies with the criteria in paragraph (f)(2)(iii) of 29 CFR 1926.1101, that employee exposures during an operation are expected to be consistently below the PELs.

#### 1.3.39 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and may not release fibers in excess of the action level during any appropriate use, handling, storage, transportation, or processing. Nonfriable asbestos containing material must be removed prior to demolition/renovation. Nonfriable asbestos containing materials are to be disposed as special waste at a state permitted subtitle D landfill approved to accept asbestos..

# 1.3.40 Presumed Asbestos Containing Material (PACM)

Thermal system insulation and surfacing material found in buildings constructed no later than 1980.

## 1.3.41 Personal Monitoring

Sampling of airborne asbestos fiber concentrations within the breathing zone of an employee.

# 1.3.42 Prior Experience

Experience required of the contractor, his employees, and his Industrial Hygienist on asbestos projects of similar nature and scope to insure capability of performing the asbestos removal in a satisfactory manner. Similarities will be in areas related to material composition, project size, number of employees and the engineering work practice and personal protection controls required.

Page 617 of 947

# 1.3.43 Regulated Areas

Areas established to demarcate where Class I, II and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit.

# 1.3.43.1 Enclosed Regulated Area

A regulated area which has been isolated by physical boundaries and maintained under negative pressure to prevent the spread of asbestos dust, fibers, or debris. A local HEPA filtered exhaust system is required.

- 1.3.44 Regulated Asbestos-Containing Material (RACM) for abatement at Fort Campbell will include the following:
  - (a) Friable asbestos containing material
  - (b) All category I nonfriable ACM
  - (c) All category II nonfriable ACM
- 1.3.45 Thermal System Insulation (TSI)

ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain.

1.3.46 Thermal System Insulation ACM

Thermal system insulation which contains more than 1 percent asbestos.

1.3.47 Time Weighted Average (TWA)

The TWA is an individuals 8-hour time weighted average of airborne concentration of fibers per cubic centimeter of air.

# 1.4 SUBMITTALS

The following will be submitted to and approved by the contracting officer prior to commencing work involving asbestos materials:

- 1.4.1 SD-01, Data
- 1.4.1.1 Local Exhaust Equipment;

- Section: Appendix DD
- 1.4.1.2 HEPA Vacuum Equipment;
- 1.4.1.3 Respirators; including fit test records
- 1.4.1.4 Pressure Differential Monitor;
- 1.4.1.5 Hazardous Communication Plan (if hazardous materials will be brought onto site)

# 1.4.1.6 Training Data

Submit signed and dated certificates for each employee that has received training for the appropriate task(s) assigned and the required amount of hours for the proper handling of materials that contain asbestos, that the employee understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limitations of the respiratory equipment to be used; understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment; and understands engineering and other hazard control techniques and procedures.

# 1.4.2 SD-08 Statements

# 1.4.2.1 Testing Laboratory;

Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of asbestos fibers. The laboratory will be approved by the American Industrial Hygiene Association (AIHA) to participate in the AAR program. Submit proof that persons reading the samples have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program or proof that the individuals reading the air samples are current participants in the Asbestos Analysts Registry (AAR). If bulk sample analysis is necessary the testing laboratory will have to submit their certification of National Laboratory Accreditation Program (NVLAP) participation.

# 1.4.2.2 Industrial Hygienist;

Submit the name, address, and telephone number of the Industrial Hygienist selected to prepare the asbestos plan, direct monitoring and perform training, and a certification that the Industrial Hygienist is certified by the American Board of Industrial Hygiene, including certification number, and date, and their previous experience in asbestos removal activities. For the purposes of this specification the terms industrial hygienist, Certified Industrial Hygienist and CIH are synonymous. The industrial hygienist will be contracted by the abatement firm performing the work. In addition to being a CIH, the

individual must be accredited in the discipline he is performing. The Industrial Hygienist must be an accredited building inspector if he is to collect samples or an accredited designer if he is to perform asbestos design specifications.

# 1.4.2.3 Prior Experience;

As evidence that the asbestos removal effort will be accomplished by trained and competent personnel totally familiar with safe and legal asbestos working practices, the contractor will furnish for Government approval (for himself or for his selected asbestos removal subcontractor) written documentation of successfully completed asbestos abatement projects of similar nature and scope. A short summary of three (3) asbestos abatement projects performed will include:

- a. The name, address, and telephone number of the contact person(someone specifically familiar with the contractor's work). If available, include copies of letters of reference from previous users of the contractors service.
- b. A short description of the type of removal (e.g. pipe lagging, sprayed girders and/or ceilings, transite siding, etc.), its extent (square feet, linear feet), and days to complete (scheduled and actual).
- c. Documentation of any licenses or certifications as an asbestos abatement Contractor in the jurisdiction covered. If none, a negative response is required.
- d. The contractor will certify that the firm and its employees are familiar with regulations of the Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA)cited in the project specification and related to asbestos abatement.
- e. The contractor will further document that no RACM will be stripped, removed, or otherwise be handled or disturbed unless at least one on-site representative, such as a foreman, management level, or other authorized representative trained in the provisions of this regulation and the means of complying with them, is present. Annually the trained on-site individual will receive refresher training in the provisions of this regulation. The required training will include as a minimum: applicability; notifications; material identification; control procedures for removals including, at least, wetting, local exhaust ventilation, negative pressure enclosures, glove-bag procedures, and High Efficiency Particulate Air (HEPA) filters; waste disposal work practices; reporting and record keeping; and asbestos hazards and worker protection. Evidence that the required training has been completed will be posted and made available for inspection by the NESHAP administering agency at the demolition or renovation site.
- f. A notarized statement, signed by an officer of the asbestos abatement company, containing the following information: (If none, a negative reply is required.)

- (1) A record of any citations issued by Federal, State or local: regulatory agencies relating to asbestos abatement activity. Include projects, dates and resolutions.
- (2) A list of penalties incurred through noncompliance with asbestos abatement project specifications including liquidated damages, overruns in scheduled time limitations and resolutions
- (3) Situations in which an asbestos related contract has been terminated including projects, dates and reasons for terminations.
- (4) A listing of any asbestos-related legal proceedings/claims which the contractor (or employees Scheduled to participated in this project) has participated or is currently involved. Include descriptions of role, issue and resolution to date.

# 1.4.2.4 Asbestos Plan;

Submit a detailed Plan of the work procedures to be used in the removal and disposal of materials containing asbestos. Include in the Plan an explanation of Initial Exposure Assessment. The Plan will be prepared, signed, and sealed, including certification number and date, by the contractor's Certified Industrial Hygienist. Such Plan will include a sketch showing the location, size, and details of regulated areas, location and details of the decontamination area, layout of decontamination area, and locations of local exhaust equipment. The Plan will also include interface of trades involved in the construction, sequencing of asbestos-related work, disposal plan, type of wetting agent to be used, air monitoring, respirators, protective equipment, pressure differential monitoring device, and a detailed description of the method employed in order to control ambient air conditions within the regulated area. All milestones and schedules will be included within this Plan. The Plan will be approved by the contracting officer prior to the start of any asbestos work. Prior to beginning work, the contractor will meet with the contracting officer to discuss in detail the Asbestos Plan, including work procedures and safety precautions.

# 1.4.2.5 Notification Requirements;

## a. Initial Notification

At least 10 working days before asbestos stripping or removal work or any other activity begins such as site preparation that would break up, dislodge or similarly disturb asbestos containing materials.

#### The contractor will:

(1) Provide the U.S. Environmental Protection Agency (EPA) Regional NESHAP administering agency with the required notice of intention to demolish or renovate. If

work is performed in Tennessee, notification shall be in accordance with State of Tennessee regulation Ch 1200-3-11 and Code of Federal Regulations 40 CFR 61, Subpart M. The contractor will send notification forms to:

Department of Environment and Conservation-Division of Air Pollution Control 9th Floor, L&C Annex

401 Church Street

Nashville, Tennessee 37243-1531.

If the work is performed in Kentucky, the NESHAP notification forms are to be sent to the:

Kentucky Division for Air Quality Asbestos Branch, Paducah Region 4500 Clarks River Road Paducah, Kentucky 42003

Forms are located at the end of this section. Work will not commence on any dates other than those stated in the notification without re-notification of all parties. Delivery of the notice by U.S. Postal Service, commercial delivery service, or hand delivery is acceptable. The contractor will also provide the Contracting Office representative copies of all notifications and re-notifications.

- (2) Update notice, as necessary, including when the amount of asbestos affected changes by at least 20 percent.
- (3) The contractor will submit to the Contracting Administrator (CA) a copy of the NESHAP notification on the same day it is sent to the administrating agency (state). The CA will, in-turn, forward a copy of the NESHAP notification to the Directorate of Public Works/Environmental Division/Compliance Branch, Building 2182, 13 ½ Street, IMSE-CAM-PWE, Fort Campbell, KY 42223-5130. The contractor will provide the Contracting Officer Representative (COR) and Environmental Division notification 48 hours prior to the start of removal or disturbance of Asbestos Containing Material (ACM). If the contractor was not required by the state to submit a NESHAP notification, the contractor shall submit to the Contracting Officer Representative (COR) 48 hour electronic notification of intent to start removal of asbestos containing material. Such notification shall include the following:
  - o Building number
  - Anticipated start and end dates
  - o Description of material being disturbed or abated
  - o Quantity of material being disturbed or abated including units (SF, LF, CY)
  - Description of approximate location of work (e.g. latrines, NW corner of building, 2<sup>nd</sup> floor, etc.)

The COR will in turn forward a copy of the notification to the DPW Environmental Division

b. Re-notification

For asbestos stripping or removal work in a demolition or renovation operation that will begin on a date other than the one contained in the original notice, notice of the new start date must be provided to the NESHAP-administering agency as follows:

- (1) When the asbestos stripping or removal operation or demolition operation covered by this paragraph will begin after the date contained in the notice,
- (a) Notify the NESHAP administering agency of the new start date by telephone as soon as possible before the original start date, and
- (b) Provide the NESHAP administering agency with a written notice of the new start date as soon as possible before, and no later than, the original start date. Delivery of the updated notice by the U.S. Postal Service commercial delivery service, or hand delivery is acceptable.
- (2) When the asbestos stripping and removal operation or demolition operation covered by this paragraph will begin earlier than the original start date, provide the NESHP administering agency with a written notice of the new start date at least 10 working days before asbestos stripping or removal work begins.
- (3) In no event will an operation covered by this paragraph begin on a date other than the date contained in the written notice of the new start date.

## c. Notification Information

The following will be included in the notice:

- (1) An indication of whether the notice is the original or a revised notification.
- (2) Name, address, and telephone number of both the facility owner and operator and the asbestos removal contractor.
  - (3) Type of operation: demolition or renovation.
- (4) Address including specific building number and description of the facility or affected part of the facility including the size (square meters/square feet and number of floors), age, and prior use of the facility.
- (5) Procedure, including analytical methods, employed to detect the presence of RACM and Category I and Category II nonfriable ACM.
- (6) Estimate of the approximate amount of RACM to be removed from the facility in terms of length of pipe in linear meters (linear feet), surface area in square meters (square feet) on other facility components, or volume in cubic meters (cubic feet).

- (7) Location of the facility being demolished or renovated.
- (8) Scheduled start and completion dates of demolition or renovation.
- (9) Description of planned demolition or renovation work to be performed and method(s) to be employed, including demolition or renovation techniques to be used and description of affected facility components.
- (10) Description of work practices and engineering controls to be used to comply with the requirements of this subpart, including asbestos removal and waste-handling emission control procedures.
- (11) Name and location of the waste disposal site where the asbestos-containing material will be deposited.
- (12) A certification that at least one person trained as required by paragraph (e) of 1.4.2.3 of this section will supervise the stripping and removal described by this notification.
- (13) Description of procedures to be followed in the event that unexpected ACMs are encountered.
  - (14) Name, address, and telephone number of the waste transporter.

## d. Demolition

Refer to Appendix A-10 for demolition NESHAP requirements.

# 1.4.3 SD-09, Reports

# 1.4.3.1 Monitoring Results;

Fiber counting will be completed and results reviewed by the Certified Industrial Hygienist within 16 hours. The CIH will notify the contractor and the contracting officer immediately of any exposures to fibers in excess of the acceptable limits. Submit monitoring results to the contracting officer within 3 working days, signed by the testing laboratory, the employee performing air monitoring and the CIH.

# 1.4.3.2 Local Exhaust System;

Local exhaust systems must be installed and operated in accordance with ANSI Z9.2-79. The local HEPA filtered exhaust system will be operated continuously, 24 hours a day, to maintain the enclosure under negative pressure until the enclosure of the regulated area is removed. Pressure differential recordings for each workday will be reviewed by the Industrial Hygienist and submitted to the contracting officer within 24

hours from the end of each workday. The contractor will notify the contracting officer immediately of any variance in the pressure differential which could cause exposure of adjacent unsealed areas to asbestos fiber concentrations.

# 1.4.3.3 Job Progress Report;

During abatement activities, the Industrial Hygienist will submit a weekly job progress report to the contracting officer detailing abatement activities. Include review of progress with respect to Asbestos Plan, milestones and schedules, major problems and actions taken, injury reports, equipment breakdowns and a compilation of the weeks bulk material and air sampling results conducted by the contractor's Industrial Hygienist or air sampling professional. Submission of individual monitoring results will be as dictated by SD-09, Reports. The progress report will be signed by the contractor, asbestos abatement subcontractor and the Industrial Hygienist.

1.4.3.4 Within 48 hours after removal of asbestos containing material (ACM), the contractor will provide the Contract Administrator (CA) a copy of the asbestos survey drawings that annotates in blue or red ink the ACM(s) that have been removed as a result of the project. A copy of the building asbestos survey drawings may be obtained at the DPW Environmental Division. The CA will in-turn forward a copy of the survey annotation to the Directorate of Public Works / Environmental Division / Compliance Branch, Building 2182, 13 ½ Street, IMSE-CAM-PWE, Fort Campbell, Kentucky 42223-5130.

# 1.4.4 SD-13, Certificates

## 1.4.4.1 Local exhaust and HEPA vacuum filters;

Local exhaust and HEPA vacuum filters need to be maintained as per manufacturers specifications. Asbestos prefilters need to be replaced daily and HEPA filters changed based upon daily readings of the manometer as described in section 2.7 of this specification.

## 1.4.4.2 Respirators;

Respiratory protection will be provided by the contractor according to 29 CFR 19261101.and the requirements specified in section 2.2 of this specification. The contractor will have developed and implemented a respiratory protection program meeting all the requirements of 29 CFR 1910.134 OSHA□s Respiratory Protection Standard.

## 1.4.5 SD-18, Records

## 1.4.5.1 Landfill Delivery Records;

Submit written evidence that the contractor plans to use the <u>Woodlawn</u> Landfill for disposal and will follow all approved procedures for asbestos disposal issued by the EPA, state and local regulatory agencies. Submit copies of all waste shipment records and resulting correspondence. An <u>Asbestos Waste Shipment</u> Record appears at the end of this specification.

#### 1.5 TITLE TO MATERIALS

Materials resulting from demolition work, except as specified otherwise, will become the responsibility of the contractor and will be disposed of as specified herein.

#### 1.6 PROTECTION OF EXISTING WORK TO REMAIN

Perform demolition work without damage or contamination of adjacent work. Where such work is damaged or contaminated, restore work to the original condition at no additional cost to the government.

## 1.7 SEQUENCE OF WORK

No other work shall be performed in the asbestos regulated area prior to completion and certification of the asbestos abatement work.

# 1.8 PERMISSIBLE EXPOSURE LIMITS (PELS)

a.Time-weighted average limit (TWA). Ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter of air as an eight (8) hour time-weighted average (TWA).

b. Excursion limit. Ensure that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1.0 f/cc) as averaged over a sampling period of thirty (30) minutes.

# 1.9 MEDICAL SURVEILLANCE 29 CFR 1926.1101(m)

## 1.9.1 Medical examinations

Submit evidence of a medical surveillance program for all employees who for a combined total of 30 or more days per year are engaged in Class I, II and III work or are exposed at or above the permissible exposure limit or excursion limit, and for employees who wear negative pressure respirators. The content of the examination shall be consistent with 29 CFR 1926.1101 (m). This examination is not required if adequate records show the employee has been examined as required by 29 CFR

1926.1101 (m) within the past year. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos fibers and within 30 calendars days before or after the termination of employment in such occupation.

## 1.9.2 Medical Records

Maintain complete and accurate records as required by 29 CFR 1926.1101(n) employees' medical examinations for a period of at least 40 years after termination of employment and make records of the required medical examinations available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health, The Director of the National Institute for Occupational Safety and Health (NIOSH), authorized representatives of either, and an employee's physician upon the request of the employee or former employee.

## I.IO TRAINING

All workers must receive training specific to the tasks performed on the project. In addition, each employee must have received an equivalent level of training within 3 months prior to assignment to asbestos work or shall be instructed for a minimum of 8 hours by the CIH with regard to the methods of recognizing asbestos; the health effects associated with asbestos; the relationship between smoking and asbestos in producing lung cancer; its purposes, proper use, fitting instructions, and limitations of respirators; the nature of operations that could result in exposure to asbestos, the importance of necessary protective controls to minimize exposure and any necessary instructions in the use of these controls and procedures; the appropriate work practices for performing the asbestos removal job; medical surveillance program requirements; and a review of 29 CFR 1926.1101 safety and health precautions and the use and requirements for protective clothing and equipment including respirators. Fully cover engineering and other hazard control techniques and procedures. Maintain complete and accurate records of training for each employee. Records shall be maintained for one year beyond the last date of employment.

Employees who perform Class I or Class II removals will have received the EPA worker 4-day course. Supervisors will have received the EPA 5-day Competent person training.

## 1.12 PERMITS

Obtain necessary permits in conjunction with this project for the abatement, demolition, transportation and disposal of asbestos containing materials, and provide timely notification of such actions as may be required by Federal, State, regional, and local authorities. Refer, also, to SD-18, Records (Landfill Delivery Records) for additional requirements.

#### 1.13 SAFETY AND HEALTH COMPLIANCE

In addition to detailed requirements of this specifications, comply with laws, ordinances, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101 and 40 CFR 61, Subpart A and 40 CFR 61, Subpart M. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where specification requirements and referenced documents vary, the most stringent requirements will apply.

# PART 2 PRODUCTS

## 2.1 EQUIPMENT AND MATERIAL USED IN REMOVAL OPERATIONS

Furnish the contracting officer with two complete sets of personal protective equipment, as required herein, for each entry into and inspection of the regulated area.

## 2.2 RESPIRATORS

The contractor will provide respirators, and ensure they are used in the following circumstances. Respiratory protection is required on all asbestos abatement jobs.

- a. During all class I removal jobs.
- b. During all class II work where the ACM is not removed in a substantially intact state.
- c. During all Class II and III work which is not performed using wet methods, provided, however that respirators need not be worn during removal of sloped roofs when a negative exposure assessment has been made and the ACM is removed in an intact state.
- d. During all Class II and III asbestos jobs where the contractor does not produce a "negative exposure assessment."
- e. During all Class III jobs where TSI or surfacing ACM or PACM is to be disturbed.
- f. During all Class IV work performed in regulated areas where employees performing other work are required to wear respirators.
- g. During all work where employees are exposed above the PEL or the excursion limit.

# h. During emergencies.

Select respirators approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing asbestos fibers according to the table below. During the performance of work when removal or demolition of asbestos materials is not underway and after the TWA and ceiling limits have been established, the contractor shall provide respirators as required in 29 CFR 1926.1101(h). The contractor shall establish a respirator program as required by ANSI Z88.2-80 and 29 CFR 1910.134.

## RESPIRATORY PROTECTION FOR ASBESTOS FIBERS

<u>Airborne concentration of asbestos or</u> condition of use

Required respirator

Not in excess of 1 f/cc (I0XPEL), or

as

Half-mask air purifying respirator otherwise required independent other than a

disposable, equipped

of exposure

with high efficiency filters.

Not in excess of 5 f/cc (50XPEL). Full-face piece air purifying

respirator equipped with high

efficiency filters.

Not in excess of 10 f/cc (100XPEL). Any powered air-purifying

respirator equipped with high efficiency filters or any supplied

air respirator operated in continuous flow mode.

Not in excess of 100 f/cc (100XPEL) Full-face piece supplied - air

respirator operated in pressure demand mode.

Greater than 100 f/cc Full-

(1,000XPEL), or unknown concentration.

Full-face piece supplied air

respirator operated in

pressure demand mode, equipped with an auxiliary positive pressure self contained breathing apparatus.

<sup>\*</sup>Airborne concentrations are based upon the 8 hour TWA - PEL

\*A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.

\*Air purifying respirators must be equipped with high-efficiency particulate air (HEPA) filters. The HEPA filters are not reusable.

In addition to the above selection criteria the contractor will provide tight fitting powered air purifying respirators equipped with high efficiency filters or a full face piece supplied air respirator operated in the pressure demand mode equipped with HEPA egress cartridges or an auxiliary positive pressure self contained breathing apparatus for all employees within the regulated area where Class I work is being performed for which a negative exposure assessment has not been produced and the exposure assessment indicates the level will not exceed 1 f/cc as an 8- hour time weighted average. A full face piece supplied air respirator operated in the pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions, if the exposure assessment indicates exposure levels above 1.0 f/cc as an 8-hour time weighted average.

## 2.3 SPECIAL CLOTHING

# 2.3.1 Protective Clothing

Protective clothing shall be coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings.

# 2.3.2 Work Clothing

Provide boot covers and cloth work clothes to be worn under the protective coveralls.

# 2.4 HYGIENE FACILITIES

A decontamination area shall consist of an equipment room, shower area, and clean room in series. The equipment room shall be supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective equipment. Shower facilities shall be provided which comply with 29 CFR I910.14(d)(3). The clean change room shall be equipped with a locker or appropriate storage container for each employee's use.

# 2.5 EYE PROTECTION

Provide goggles for personnel engaged in asbestos operations when the use of a full face respirator is not required.

Eye protection will be provided as per 29 CFR 1910.133 OSHA's Eye and Face Protection Standard.

#### 2.6 WARNING SIGNS AND LABELS

# 2.6.1 Warning Signs

Warning signs must be of sufficient size to be clearly legible and display the following information:

**DANGER** 

**ASBESTOS** 

CANCER AND LUNG DISEASE HAZARD

**AUTHORIZED PERSONNEL ONLY** 

RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

# 2.6.2 Warning Labels

Labels must be of sufficient size to be clearly legible, printed in large, bold letters on a contrasting background, and displaying the following legend:

DANGER

**CONTAINS ASBESTOS FIBERS** 

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

## 2.7 LOCAL EXHAUST SYSTEM

Provide a local exhaust system in the enclosed regulated areas. Filters on vacuums and exhaust equipment will be UL 586-labeled HEPA filters. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.02 inches of water column relative to adjacent, unsealed areas. The local exhaust system must be equipped with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inches of water and accuracy within plus or minus 10 percent. The manometer must be calibrated daily as recommended by the manufacturer. Provide manually recorded manometer readings of the pressure differential between the enclosed regulated area and adjacent unsealed areas at the beginning of each workday and every 2 working hours thereafter. The local exhaust system will be operated continuously, 24 hours per day, until the regulated area enclosure is removed. Replace filters as required to maintain the efficiency of the system. The building heating,

ventilating, and air-conditioning (HVAC) system will not be used as the local exhaust system for the enclosed regulated area.

# 2.8 TOOLS AND MISCELLANEOUS EQUIPMENT

# 2.8.1 Airless Sprayer

An airless sprayer, suitable for application of sealing material, will be used.

# 2.8.2 Scaffolding

Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations.

# 2.8.3 Transportation Equipment

Transportation equipment, as required, will be suitable for loading, temporary storage, transporting, and unloading of contaminated waste without exposure to persons or property.

# 2.8.4 Vacuum Equipment

All vacuum equipment utilized in the work area will utilize HEPA filtration systems.

# 2.8.5 Water Sprayer

The water sprayer will be an airless or other low pressure sprayer for amended water application.

## 2.8.6 Other Tools and Equipment

The contractor shall provide other suitable tools for the stripping, removal, encapsulation and disposal activities including but not limited to: knives, stiff nylon brushes, sponges, rounded edge shovels, brooms, and carts.

## 2.9 MATERIALS

## 2.9.1 Lockdown Sealant

The sealing agent will be penetrating sealants and will meet the following criteria:

a. They will withstand most impact or abrasion and protect the surface.

Section: Appendix DD Page 632 of 947

b. Sealants selected for use by the contractor will be one of those demonstrating probable effective performance under the tests conducted by an independent testing laboratory and are approved by the contracting officer.

- c. They will have high flame retardant characteristics, and a low toxic fume and smoke emission rating.
- d. They will not be noxious or toxic to application workers, or subsequent workers in the area.
- e. They will have some permeability to water vapor to prevent condensation accumulation, and resist solution by common cleaning agents. They will be water insoluble when cured.
  - f. They will be acceptable weathering and aging characteristics.
  - g. They will be acceptable by architectural standards.
- h. They will be compatible with all insulating material likely to be applied to the stripped surfaces.
- I. They will be demonstrably capable of adhering to the surfaces of the substrate.
- j. They must contain a light blue or red paint tint. (Food coloring is not acceptable.)

## PART 3 EXECUTION

# 3.1 GENERAL

# 3.1.1 Respirator Program.

Submit evidence of a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

## 3.1.2 Protective Clothing

Provide and require the use of protective clothing for any employee exposed to airborne concentrations of asbestos that exceed the TWA and/or excursion limit, or for which a required negative exposure assessment is not produced, and for any employee performing Class I and II operations (other than roofing felts and mastics) which involve the removal of over 25 linear or 10 square feet of TSI or surfacing ACM and PACM.

## 3.1.3 Hygiene Facilities

For employees performing Class I work involving over 25 linear or 10 square feet of TSI or surfacing ACM and PACM, establish a decontamination area that consists of an equipment room, shower area, and clean room in series. Ensure that employees enter and exit the regulated area through the decontamination area. Where it is demonstrated that it is not feasible to locate the shower between the equipment room and the clean room, or where work is performed outdoors, ensure that employees remove asbestos contamination from their work suits in the equipment room using a HEPA vacuum before proceeding to a shower.

# 3.1.4 Warning Signs and Labels

Provide warning signs at approaches to regulated areas containing airborne asbestos fibers. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to asbestos materials, scrap, waste, debris, and other products contaminated with asbestos.

# 3.1.5 Accessibility of Work Areas

The Government will rearrange areas to the extent of providing a reasonable, direct, and an unobstructed path to the work sites. During asbestos removal, the Contractor will confine his equipment and employee pattern to these designated areas. Where the building is still occupied during the removal operations, interference with the functional operation of the building occupants outside these areas will not be permitted. Where conflicts arise due to Contractor's operations, the decision of the Contracting officer or his authorized representative will be final.

# 3.1.6 Preparation for Removal

# 3.1.6.1 Movable Furnishings

Movable furnishings, equipment and fixtures in the work area will be pre-cleaned and removed from the area of work by the Government before asbestos work begins.

# 3.1.6.2 Pre-Cleaning

All wall and floor surface areas, other than those from which asbestos is to be removed, and all non-movable furnishings, equipment, and fixtures remaining in the work area will be pre-cleaned with a HEPA filter equipped vacuuming device or wet cleaning methods prior to sealing with plastic sheeting. Do not use any methods which would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. After pre-cleaning, enclose fixed objects in 6-mil polyethylene sheeting, label, and seal securely with tape, objects which must remain in the work area and that require special ventilation or enclosure requirements will be suitably protected as approved by the

contracting officer. Items in the work area which may require access by user during abatement will be designated during the pre-abatement walkthrough and enclosures constructed with access flaps sealed with waterproof tape.

# 3.1.7 Regulated Areas

All Class I, II, and III asbestos work will be conducted within regulated areas. The regulated area will be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne concentrations of asbestos. Where critical barriers or negative pressure enclosures are used, demarcate the regulated area. Signs will be provided and displayed pursuant to 29 CFR 1026.1101(k)(6). Access to regulated areas will be limited to authorized persons. All persons entering a regulated area where employees are required to wear respirators, will be supplied with a respirator. All asbestos work performed within regulated areas will be supervised by a competent person.

# 3.1.7.1 Enclosed (Critical Barrier) Regulated Area Requirements

Seal openings in areas where the release of airborne asbestos fibers is expected. Establish a regulated area with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated area. The established regulated area will be provided with protective covering of walls and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheeting sealed with tape to prevent water or other damage and two layers of 6-mil plastic sheeting over floors extending a minimum of 24 inches up walls. All penetrations of the floor, walls, and ceiling will be sealed with 6-mil polyethylene plastic and duct tape. Seal joints using spray adhesive and duct tape. Openings will be allowed in enclosures of regulated areas for the supply and exhaust of air for the local exhaust system.

## 3.2 ASBESTOS ABATEMENT PROCEDURES

## 3.2.1 Initial Exposure Assessment

Ensure that a "competent person" conducts an exposure assessment immediately Before or at the initiation of the operation to ascertain expected exposures during that operation or workplace. The assessment must be completed in time to comply with requirements which are triggered by exposure data or the lack of a "negative exposure assessment," and to provide information necessary to assure that all control systems planned are appropriate for that operation and will work properly.

An Initial Exposure Assessment will be conducted in accordance with 29 CFR 1926.1101

For Class I asbestos work, until exposure monitoring is conducted, and is documented that employees on the job will not be exposed in excess of the PELs, or otherwise makes a negative exposure assessment, it is presumed that employees are exposed in excess of the TWA and excursion limit. A negative exposure assessment can only be obtained by demonstrating requirements contained in 29 CFR 1926.1101.

# 3.2.2 Monitoring Requirements

Perform exposure monitoring as required to determine accurately the airborne concentrations of asbestos to which employees are exposed. Determinations of employee exposure will be made from breathing zone air samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee. Representative 8-hour TWA employee exposure will be determined on the basis of one or more samples representing full-shift exposure for employees in each work area. Representative 30-minute short-term employee exposures will be determined on the basis of one or more samples representing 30-minute exposures associated with operations that are most likely to produce exposures above the excursion limit for employees in each work area.

# 3.2.2.1 Monitoring Prior to Asbestos Work

Provide area monitoring and establish the reference TWA I day prior to the masking and sealing operations for each asbestos removal site. The reference TWA is determined by taking at least three general area air samples in each asbestos regulated area.

## 3.2.2.2 Periodic monitoring

Conduct daily monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area who is performing Class I or II work unless a negative exposure assessment for the entire operation has been made. Conduct periodic monitoring of all work where exposures are expected to exceed a PEL at intervals sufficient to document the validity of the exposure prediction. When all employees required to be monitored daily are equipped with supplied-air respirators operated in the positive-pressure mode, daily monitoring is not required. However employees performing Class I work using a control method which is not listed in Class I Requirements paragraph, will continue to be monitored daily even if they are equipped with supplied-air respirators.

# 3.2.2.3 Monitoring Adjacent Areas Prior to Asbestos Work

Provide area monitoring and establish the reference TWA inside the building outside the enclosed regulated area I day prior to beginning asbestos work.

# 3.2.2.4 Termination of Monitoring

If the periodic monitoring reveals that employee exposures, as indicated by statistically reliable measurement, are below the PEL and excursion limit, monitoring may be discontinued for those employees whose exposures are represented by such monitoring. Institute additional monitoring whenever there has been a change in process, control equipment, personnel or work practices that may result in new or additional exposures above the PEL and/or excursion limit.

# 3.2.3 Respiratory Protection

Respirators will be provided and used according to the requirements of 29 CFR 1926.1101 and section 2.2 of this specification.

## 3.2.4 Controls and Work Practices

The following controls and work practices will be used in all classes of work regardless of levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters to collect all debris and dust containing ACM or PACM;
- b. Wet methods, or wetting agents, to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup, except where demonstrated that the use of wet methods are infeasible:
- c. Prompt clean-up and disposal of wastes and debris contaminated with asbestos in leak-tight container;
  - d. Local exhaust ventilation equipped with HEPA filter dust collection systems;
  - e. Enclosure or isolation of processes producing asbestos dust:
- f. Ventilation of the regulated area to move contaminated air away from the breathing zone and toward a filtration or a collection device equipped with a HEPA filter.

The following work practices and controls <u>will not be</u> used for work related to asbestos or the work which disturbs ACM or PACM, regardless of measured levels of asbestos exposure or results of the initial exposure assessments:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filters exhaust air:
- b. Compressed air used to remove asbestos, or ACM, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air;

c. Dry sweeping, shoveling or other dry clean-up and debris containing ACM and PACM;

d. Employee rotation as a means of reducing employee exposure to asbestos.

# 3.2.5 Class I Abatement Requirements

In addition to all provisions required in control and work methods above, the following controls and work practices will be used for all Class I work.

- a. Installation and operation of the control systems, will be supervised by a competent person.
- b. Work involving the removal of more than 25 linear or 10 square feet of thermal system insulation or surfacing material; for all other Class I jobs, where a negative exposure assessment, or where employees are working in areas adjacent to the regulated area, while the Class I work is being performed, use one of the following methods to ensure that airborne asbestos does not migrate from the regulated areas:
  - (1) Critical barriers will be placed over all openings to the regulated area;
- (2) Use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust; and perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, Subpart 3, or that perimeter area levels are no more than background levels representing the same area before the asbestos work began.
- c. HVAC systems will be isolated in the regulated area by sealing with a double layer of 6 mil plastic or the equivalent;
- d. Impermeable drop cloths will be placed on surfaces beneath all removal activity;
- e. All objects within the regulated area will be cleaned out and covered with impermeable drop cloths or plastic sheeting which is secured by duct tape or an equivalent.
- f. Where a negative exposure assessment cannot be produced, or where exposure monitoring shows that a PEL is exceeded, ventilate the regulated area to move contaminated air away from the breathing zone of employees toward a HEPA filtration or collection device.

# 3.2.5.1.1 Vinyl and Asphalt Flooring Materials

For removing vinyl and asphalt flooring materials which contain ACM in buildings constructed no later than 1980:

- a. Flooring or its backing will not be sanded.
- b. Vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) will be used to clean floors.
- c. Resilient sheeting will be removed by cutting with wetting of the snip point and wetting during delamination. Rip-up of resilient sheet floor material is prohibited.
- d. All scraping of residual adhesive and/or backing will be performed using wet methods.
  - e. Dry sweeping is prohibited.
- f. Mechanical chipping is prohibited unless performed in a negative pressure enclosure which meets the requirement of this section.
- g. Tiles will be removed intact, unless it is demonstrated that intact removal is not possible.
  - h. When tiles are heated and can be removed intact, wetting may be omitted.
- I. Resilient flooring material including associated mastic and backing will be assumed to be asbestos-containing materials unless an industrial hygienist determines them to be non asbestos containing materials using recognized analytical techniques.
- J. Splash guards consisting of 6 mil polyethylene sheeting will be utilized when chemical strippers are used . Splash guards will extend along the wall from the floor to a height of 4 feet.

## 3.2.5.1.2 Any other Removal of ACM

- a. The material will be thoroughly wetted with amended water prior and during its removal.
- b. The material will be removed in an intact state unless the employer demonstrates that intact removal is not possible.
- c. Cutting, abrading, or breaking the material will be prohibited unless the employer can demonstrate that methods less likely to result in asbestos fiber release are not feasible.

d. ACM removed will be immediately bagged or wrapped, or kept wetted until transferred to a closed receptacle, no later than the end of the work shift.

#### 3.2.5.3 Asbestos Contaminated Soil

Any area of contaminated soil is to be removed of by the following procedures:

- a. Before the soil removal commences, mark the wall in the area(s) at the existing ground elevation.
- b. Using small shovels, all loose soil will be removed to a minimum depth of 3 inches.
- c. Verification of the depth will be made by measurement from the excavation floor to the bottom of the original ground elevation mark or the wall.

## 3.3 COLLECTION

3.3.1 Nonfriable Non-Regulated Asbestos Containing Material (Non-RACM)

The non-friable ACM found in this project will be handled as RACM and will require special collection action as detailed in Para. 3.3.2.

The notification requirements of Para. 1.4.2 also are applicable to Non-RACM.

3.3.2 Regulated Asbestos Containing Material (RACM)

All asbestos containing materials for this project will be treated as RACM due to the nature of the materials present. Asbestos containing material will be removed in manageable sections and maintained in a wet condition. Material should be containerized upon removal and before being moved to any new location.

Maintain surfaces of the regulated area free of accumulations of asbestos fibers. Restrict the spread of dust and debris; keep waste from being distributed over the general area. Do not dry sweep or blow down the space with compressed air.

Collect asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing which may produce airborne concentrations of asbestos fibers; place in sealed impermeable bags imprinted with a caution label (Para. 2.6.2) and label with the name of the contractor and the location at which the waste was generated. The sealed bags will then be placed in a second sealed impermeable bag also imprinted with the warning label. Bags will be placed in asbestos roll off boxes for shipment to the landfill.

## 3.3.2.1 Removing Material Intact

Asbestos containing materials should be removed intact whenever possible (removal of pipe and pipe insulation by wrapping, sealing the insulation and cutting the uninsulated ends of the pipe). Asbestos containing materials will not be dropped or thrown to the ground. Materials between 15 and 50 feet above the ground may be containerized at elevated levels or placed into inclined chutes or scaffolding for subsequent collection and containerization. Asbestos materials in open containers will be kept wet at all times.

#### 3.3.2.2 Containers

Containers (drums or 6-mil polyethylene bags) will be sealed when full. Wet material will be heavy and double bagging of waste material is required. Bags, if used, will not be overfilled. They should be securely sealed to prevent accidental opening and leakage by tying the tops of the bags in an overhand knot or by taping in goose neck fashion. Do not seal bags with wire or cord. Bags may be placed in drums for staging and transportation to the landfill. Bags will be decontaminated on exterior surfaces by wet cleaning before being placed in clean drums and sealed with locking ring tops. Where unusual circumstances prohibit use of plastic disposal bags or drums, the contractor will submit, in the asbestos plan, an alternate proposal for removal, containerizing, and disposal of the asbestos containing materials.

# 3.3.2.3 Sharp Edged Components

Asbestos containing or contaminated waste with sharp edged components (e.g. nails, screws, metal lath, tin sheeting) that could otherwise tear polyethylene bags will be placed into drums for disposal.

#### 3.3.2.4 Asbestos Contaminated Soil

Any removed soil will be placed in 6-mil plastic bags, sealed and then placed in approved containers such as fiber waste drums for disposal. Do not overfill plastic bags.

# 3.3.2.5 Wastewater

- a. Pre-filtering. Any water produced by the decontamination of either equipment or persons will be (1) collected, (2) filtered through a system capable of trapping particles 5 microns and larger, specifically designed to remove asbestos fibers, and (3) filtrate disposed into a local sanitary sewer system.
- b. Filter System. The filtration system will contain a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system by large particles. Disposable filters will be treated as asbestos waste.

- 3.4 DISPOSAL OF ACM
- 3.4.1 All Asbestos Containing Materials
- 3.4.1.1. Prior to delivery of asbestos containing materials at the Woodlawn Landfill the contractor will provide Fort Campbell, DPW Roads and Grounds at least 24 hours notice of when ACM is to be disposed.
- 3.4.2. Once drums, bags and otherwise containerized asbestos containing materials have been removed from the work area, they will be loaded into an enclosed truck for transportation to the Woodlawn landfill. Asbestos waste will not be allowed to be placed in trucks with non-asbestos waste. All bags utilized will be of 6-mil polyethylene and must be double lined.
- 3.4.3. All containers will be labeled according to the requirements of 29 CFR 1910.1200 OSHA Hazardous Communication Standard and will contain the following:

# DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD

- 3.4.4. The enclosed cargo area of the truck will be free of debris and lined with 6-mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting will be installed first and extend up the sidewalls. Wall sheeting will be overlapped and taped into place so that no materials may escape to the environment.
- 3.4.5. Drums will be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Do not throw containers into the cargo area.
- 3.4.6. Personnel loading asbestos containing waste will be protected by disposable clothing including head, body and foot protection and at a minimum, half-face piece, air purifying, dual cartridge respirators equipped with high efficiency particulate air (HEPA) filters.
- 3.4.7. Large steel dumpsters (roll-off boxes) may be used for asbestos waste disposal. These should be lined with polyethylene and should have doors, tops or covers that can be closed to prevent vandalism or other disturbance of the containerized asbestos debris and wind dispersion of asbestos fibers. Uncontainerized asbestos materials will not be placed in these type dumpsters, nor will they be used for non-asbestos waste. Bags will be placed, not thrown, into these containers to avoid splitting.
- 3.4.8. Disposal of waste asbestos material at Woodlawn Landfill. Contact Fort Campbell-DPW, Environmental Division through the Contracting Officers representative.

- 3.4.9. For temporary storage, store sealed impermeable bags in asbestos waste drums. If temporary storage is within regulated areas and under negative pressure drums are not required. An area for interim storage of asbestos waste-containing drums will be assigned by the contracting officer or by an authorized representative. This area must be secure. No ACM wastes, except those properly labeled and properly containerized and physically located in the assigned holding area will be allowed to remain at the site overnight.
- 3.4.10. Procedures for hauling and disposing will comply with 40 CFR 61 Subpart M, 40 CFR 241, 40 CFR 257, and State, regional and local standards. Vehicles used to transport asbestos containing waste material must be clearly marked. The markings must:
- (i) Be displayed in such a manner and location that a person can easily read the legend.
- (ii) Conform to the requirements for 51 cm x 36 cm (20 in. x 14 in.) upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and
- (iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

# Legend

# DANGER ASBESTOS DUST HAZARD CANCER AND LUNG DISEASE HAZARD Authorized Personnel only

# Notation

2.5 cm (1 inch) Sans Serif, Gothic or Block
2.5 cm (1 inch) Sans Serif, Gothic or Block
1.9 cm (3/4 inch) Sans Serif, Gothic or Block
14 Point Gothic

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

- 3.4.11. Upon reaching the landfill, trucks are to approach the dump location as closely as possible for unloading of the asbestos containing waste.
- 3.4.12. Bags, drums and components will be inspected as they are off loaded at the disposal site. Material in damaged containers will be repacked in empty drums or bags as necessary. Uncontaminated drums may be recycled.

3.4.13. Waste containers will be placed on the ground at the disposal site, not pushed or thrown out of trucks since the weight of wet material could rupture containers.

3.4.14. Personnel off-loading containers at the disposal site will wear protective equipment consisting of disposable head, body and foot protection and, at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency particulate air (HEPA) filters. Following the removal of all containerized waste, the truck cargo area will be decontaminated to meet the no visible residue criteria. Polyethylene sheeting will be removed and discarded along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site. If landfill personnel have not been provided with personal protective equipment for the compaction operation by the landfill operator, the contractor will supply protective clothing and respiratory protection for the duration of this operation.

# 3.4.15. Shipment Records

- a. Maintain waste shipment records, using copies of the <u>form located at the end of this section</u> and include the following information:
  - (i) The name, address, and telephone number of the waste generator.
- (ii) The name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program.
  - (iii ) The approximate quantity in cubic meters (cubic feet).
  - (iv) The name and telephone number of the disposal site operator.
  - (v) The name and physical site location of the disposal site.
  - (vi) The date transported.
  - (vii) The name, address, and telephone number of the transporter(s).
- (viii) A certification that the contents of this consignment are fully and accurately described by proper shipping name and are classified, packed, marked, labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.
- b. Provide a copy of the waste shipment record, described above to the disposal site owners or operators at the same time as the asbestos-containing waste material is delivered to the disposal site.
- c. For waste shipments where a copy of the waste shipment record, signed by the owner or operator of the designated disposal site, is not received by the contractor

within 35 days of the date the waste was transported, contact the owner or operator of the designated disposal site to determine the status of the waste shipment. The contractor will report in writing to the NESHAP administering agency if a copy of the waste shipment record, signed by the owner or operator of the designated waste disposal site, is not received by the contractor within 45 days of the date the waste was transported. Include in the report the following information:

- (i) A copy of the waste shipment record for which a confirmation of delivery was not received, and
- (ii) A cover letter explaining the efforts taken to locate the asbestos waste shipment and the results of those efforts.
- d. Retain a copy of all waste shipment records, including a copy of the waste shipment record signed by the owner or operator of the designated waste disposal site, for at least 2 years.
- e. Provide to the contracting officer within 3 working days following delivery of asbestos containing waste material copies of all waste shipment records. Also within 3 working days of initiation, provide to the contracting officer copies of any correspondence with the NESHAP administering agency.

Furnish upon request, and make available for inspection by the NESHAP administering agency, all records under this section.

## 3.4.16 Wastewater

It is the contractor's responsibility to comply with any local wastewater systems' regulations or policy regarding the disposal of wastewater from asbestos abatement activities.

# 3.5 CLEANUP AND FINAL CLEARANCE

# 3.5.1 Cleanup

Clean all surfaces in the work area and other contaminated areas with water and/or HEPA vacuum equipment. After cleaning the work area, allow 24 hours for settlement of dust and wet clean or clean with HEPA vacuum equipment all surfaces in the work area. When asbestos removal, disposal, and cleanup are complete, the contractor will certify, in writing, that the area is free of any asbestos material or debris.

## 3.5.2 Visual Inspection After Cleanup

Prior to the performance of final air monitoring, the contractor and the contracting officer or his representative will perform a visual inspection for asbestos dust/residue. If

residue is found, additional wipedown/vacuuming will be performed to the satisfaction of the contracting officer. If recleaning is required, monitor the airborne fiber concentration after recleaning.

# 3.5.3 Monitoring After Final Cleanup

After the removal site has passed the visual inspection, provide area monitoring of fibers (at least 5 samples per removal site) under aggressive conditions. Collect and analyze the samples to establish airborne asbestos fiber concentration within the area after final cleanup but before removal of the enclosure of the regulated area. The fiber counts from the samples will be less than 0.01 fibers (longer than 5 micrometers) per cubic centimeter of air or not be greater than the levels referenced as background before the work was initiated, whichever is less. Should any of the final sampling indicate a higher value, the contractor will take appropriate actions to reclean the area and will repeat the monitoring.

# 3.5.4 Sampling

Sampling under aggressive conditions will include the following procedures:

- a. Before starting the sampling pumps, direct the exhaust from forced air equipment (such as a I horsepower leaf blower) against all walls, ceiling, floors, ledges and other surfaces in the room. This should take at least 5 minutes per 1000 sq. ft. of floor.
- b. Place a 20-inch fan in the center of the room. (Use one fan per 10,000 cubic feet of room space.) Place the fan on low speed and point it toward the ceiling.
- c. Start the sampling pumps and sample for the required time.
- d. Turn off the pump and then the fan(s) when sampling is complete.

# 3.5.5 Air Clearance Failure

Should clearance sampling results fail to meet the final cleanup requirements, the contractor will take appropriate action at no additional cost to the Government, to reclean, resample, and analyze data until final cleanup requirements are met.

# 3.5.6 Site Inspection

While performing asbestos removal work, the contractor will be subject to onsite inspection by the contracting officer who may be assisted by safety or health personnel. If the work is in violation of specification requirements, the contracting officer will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time and expenses required to resolve the violation will be at the contractor's expense.

# 3.5.7 Sealing Permanent Exposed Surfaces (RACM)

After the asbestos material has been removed and HEPA vacuumed to the greatest extent possible, all permanent asbestos exposed interior surfaces will be coated with an approved lockdown sealant to permanently bind any remaining fibers in place. Sealant will be applied by airless sprayers and in accordance with the sealant manufacturers recommendations.

#### 3.5.8 Sealant Tint

The sealant will have an adequate tint to easily distinguish between sections sealed and sections not sealed.

## 3.5.9 Reestablishment of the Work Area

Reestablishment of the work area will occur only after the completion of the following to the contracting officers satisfaction: performance of clean-up procedures and the successful achievement/ documentation of clearance air monitoring values.

# 3.5.10 Visual Inspection

The contractor and contracting officer will visually inspect the work area for any remaining visible residue. Evidence of asbestos materials will necessitate additional cleaning requirements.

## 3.5.11 Clearance of Work Area

Following satisfactory clearance of the work area, remaining barriers may be removed and disposed of as asbestos contaminated waste.

# 3.5.12 Remaining Building Demolition Procedures

Contractor may proceed with remaining building demolition procedures as described in SECTION 02050: DEMOLITION.

## ASBESTOS WASTE SHIPMENT RECORD

Department of Environment and Conservation

Division of Air Pollution Control



9th Floor, L & C Annex 401 Church Street Neshville, TN 37243-1531 (615) 532-0554

## ASBESTOS WASTE SHIPMENT RECORD

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Work site name and mailing address	Owner o flattle	( )			
Operator's name and address	December's pages and address		lephone	no.	
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physical site location and disposal fac	cility permit number				
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Name and address of responsible age	ency				
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Special handling instructions and add	titional information				
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CN-1054

(Instructions on Reverse)

### INSTRUCTIONS

### Waste Generator Section (Items 1-9)

- Enter the name of the facility at which asbestos waste is generated and the address where the facility is located. In the
  appropriate spaces, also enter the name of the owner of the facility and the owner's phone number.
- 2. If a demolition or renovation, enter the name and address of the company and authorized agent responsible for performing the asbestos removal. In the appropriate spaces, also enter the phone number of the operator.
- Enter the name, address, and physical site location of the waste disposal site (WDS) that will be receiving the asbestos materials.
  In the appropriate spaces, also enter the phone number of the WDS. Enter "on-site" if the waste will be disposed of on the
  generator's property.
- Provide the name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program.
- 5. Indicate the types of asbestos waste materials generated. If from a demolition or renovation, indicate the amount of asbestos that is Friable asbestos material
  - Nonfriable asbestos material
- 6. Enter the number of containers used to transport the asbestos materials listed in item 5. Also enter one of the following container codes used in transporting each type of asbestos material (specify any other type of container used if not listed below):
  - DM Mctal drums, barrels
  - DP Plastic drums, barrels
  - BA 6 mil plastic bags or wrapping
- 7. Enter the quantities of each type of asbestos material removed in units of cubic meters (cubic yards).
- Use this space to indicate special transportation, treatment, storage or disposal or Bill of Lading information. If an alternate
  waste disposal site is designated, note it here. Emergency response telephone numbers or similar information may be included
  here.
- The authorized agent of the waste generator must read and then sign and date this certification. The date is the date of receipt by transporter.

NOTE: The waste generator must retain a copy of this form.

Transporter Section (Items 10 & 11)

10. & 11. Enter name, address, and telephone number of each transporter used. If applicable. Print or type the full name and title of person accepting responsibility and acknowledging receipt of materials as listed on this waste shipment record for transport. Enter date of receipt and signature.

NOTE: The transporter must retain a copy of this form.

Disposal Site Section (Items 12 &13)

- 12. The authorized representative of the WDS must note in this space any discrepancy between waste described on this manifest and waste actually received as well as any improperly enclosed or contained waste. Any rejected materials should be listed and destination of those materials provided. A site that converts asbestos-containing waste material to nonasbestos material is considered a WDS.
- 13. The signature (by hand) of the authorized WDS agent indicates acceptance and agreement with statements on this manifest except as noted in item 12. The date is the date of signature and receipt of shipment.

NOTE: The WDS must retain a completed copy of this form. The WDS must also send a completed copy to the operator listed in item 2.

Back to Shipment Records Paragraph 1.4.5.1

Back to Shipment Records Paragraph 15

## NOTIFICATION OF ASBESTOS DEMOLITION OR RENOVATION FORM



## DEPARTMENT OF ENVIRONMENT AND CONSERVATION DIVISION OF AIR POLLUTION CONTROL

## NOTIFICATION OF ASBESTOS DEMOLITION OR RENOVATION

Operator Project # Postmark:	Dete P	teceived			tificatio	17 <b>2</b>
Type of Notification (O-Orig., R-Revised, C-Cancelle	ed)		realistation of the		annerios (n. 10 code)	
Facility Information (Identify Owner, Removal Contr	actor, Operator)					
Owner Name:						
Address:						
City:	State:			Zip:		
Contact:		Teleph	one: (	<u>)                                    </u>		
Removal Contractor:						
Address:				· ·		
City:	State:			Zip:		
Contact:		Teleph	one: (	)		
Other Operator (If Different From Owner):						
Address:						
City:	State:			Zip:		
Contact		Teleph	one: (	)		
I. Type of Operation (D-Demo., O-Ordered Demo., R-I	Renov., E-Emer. Ren	10V.)				
/ Is Ashestos Present? (Yes/No)						
. Facility Description (Include Building Name, Number	r and Floor or Room	Number)				
Building Name:						
Address:						
City:	State:			Zip:		
Site Location:						
Building Site Total Sq. Ft.:	# of Floors: Age in Yea			Years:		
Present Use:	Prior Use:					
VI. Procedure and Analytical Method Used to Detect the		los Mater	ial			****
/I. Procedure and Analytical Method Used to Detect the	e Presence of Asbesi	los Mater	ial			
/I. Procedure and Analytical Method Used to Detect the	e Presence of Asbesi cluding					
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CN-1055

-1-

RDA 1298

XII. Waste Transporter #1			
Name:			
Address:			
City:	State:		Zip:
Contact Person;		Telephone: (	)
Waste Transporter #2			
Name:			
Address:			
City:	State:		Zip:
Contact Person:		Telephone: (	)
XIII. Waste Disposal Site			
Name:			
Location:			
City:	State:		Zip:
Telephone:			
XIV. If Demolition Ordered by a Government Agenc	y, Please Identify Belo	w;	
Name:	Title:		
Authority:			
Date of Order (mm/dd/yy):	Date Orde	red to Begin (mm/d	d/yy)
XV. For Emergency Renovations			
Date and Hour of Emergency (mm/dd/yy):			
Explanation of How the Event Caused Unsafe C	Conditions or Would Ca	ause Equipment	
Damage or an Unreasonable Financial Burden:			
		•	
XVI. Description of Procedures to be Followed in th	e Event Asbestos is F	ound or Previously	
Nonfriable Asbestos Material Becomes Crumb	led, Pulverized, or Re	duced to Powder.	
XVII.   Certify That an Individual Trained in the Pro Subpart M) Will be On-Site During the Demolif Required Training has Been Accomplished by Inspection During Normal Business Hours. (RE	tion or Renovation and This Person Will be A	d Evidence That vallable for	
(Signature of Owner	r/Operator)		(Date)
XVIII. I Certify That the Above Information is Corre	ect.		
MAIII. 1 COLUIT THE CHE CHECK INC. INC. INC. INC. INC. INC. INC. INC.			

Submit Completed Form by U.S. Postal Service / Commercial Delivery Service or Hand Deliver to:

Department of Environment and Conservation Division of Air Pollution Control 9th Floor, L & C Annex 401 Church Street Nashville, TN 37243-1531 (615) 532-0564

CN-1055

-2-

RDA 1298

**Back to Notification Requirements Paragraph 1.4.2.5** 

### WOODLAWN LANDFILL ASBESTOS POLICY

### MEMORANDUM OF UNDERSTANDING

## WOODLAWN ROAD LANDFILL FORT CAMPBELL, KENTUCKY

### ASBESTOS POLICY

Woodlawn Landfill is operated under a permit issued by the Division of Solid Waste Management, Department of Conservation, State of Tennessee and in accordance with Federal, State and Local Regulations. A special waste permit was issued by the State of Tennessee for the landfill to accept Asbestos Containing Waste, but only with certain stipulations.

Hauters bringing asbestos waste to the landfill must comply with the Pederal, State and Local Regulations and with state permit requirements. The following is a list of some of those requirements:

- Any vehicle hauling estestos containing waste must be marked with signs in accordance with APC rule 1200-3-11-02(2)(k)4 providing warning that the vehicle contains asbestos. Improperly marked vehicles will not be accepted at the landfill.
- Any vehicle hauling asbestos containing waste must be enciosed or in a covered 39-14-503 eartier as
  described in Tennessee Code Annotated. Vehicles not meeting this requirement will not be accepted at
  the landfills.
- 3. The vehicle driver and any possengers must have fit tested respirators to be present or within 100 meters during unloading operations at the fundfill. Facial hair that would interfere with a proper oir scal around the respirator is not allowed on personnel wearing respirators unless the respirator has been specifically approved for that purpose. Failure to comply with the requirement will be that individual from future entry into the landfill. A copy of the fit test certificate will be presented to the landfill operator when requested.
- 4. Asbestos waste will be placed in the area designated by the landfull personnel. The materials will be carefully unloaded to prevent spillage or puncture of the containers. Improper handling of the asbestos waste will probibil that person from future asbestos operations at the landfull.
- Asbestos waste will be accepted at the landfill only after receiving a 24 hour notice. A time will be designated for receiving the asbestos waste. Shipments arriving at the landfill more than thirty minutes from that time may be refused entry.
- 6. The shipper must furnish a copy of the NESHAP 10 day notice and an asbestos waste manifest to the landfull personnel before being accepted. Improperly completed information will be grounds to reject the acceptance of the astestos waste.

I have reed and understand the above requirements. I understand that failure to observe that regulations and requirements will cause me not to be allowed to deliver and dispose of asbestos containing waste at the Woodlawn Road Landfill.

Signature:	
Employer:	
Dete: Approved respirator fit test date:	

**Back to Shipment Records Paragraph 1.4.5.1** 

**Back to Instructions to Designers** 

## End of Section

## **Return to Table of Contents**

## SECTION 02 83 33.13 20 Lead in Construction

## Ft. Campbell Requirements:

Removal and disposal of lead-based paint materials shall be conducted in accordance with Ft. Campbell specification section 02 83 13.00 20, Lead in Construction, which shall be included in all projects containing or possibly containing lead-based products.

## **Instruction to Designers:**

- 1. All projects containing or possibly containing lead products shall include Ft. Campbell specification section <u>02 83 13.00 20</u>, <u>Lead in Construction</u>
- 2. Additional Environmental guidance applies. See Appendix A.
  - ous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.
  - c. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

## 3.5.4.1 Disposal Documentation

Submit written evidence that the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA and state or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. Manifest must be signed by the HW manager as well as transporter before leaving the installation.

3.5.5 Disposal of Lead Contaminated Non-Hazardous Waste

Any portion of the segregated waste products which does not test as hazardous by the testing requirements stated above, may be disposed at the Woodlawn Landfill.

3.5.6 Payment for Hazardous Waste Disposal

Section: Appendix DD

Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Government.

Table 1: Lead Contamination Levels

OSHA Instruction CPL 2-2.58 NFC 13 993 Office of Health Compliance Assistance

### APPENDIX C APPLICABLE PARAGRAPHS OF 1926.62

For Specific Air Lead Levels						
Regardless	≥ AL. 1 - 30 Days > 30 Days		> PEL	> 4 X PEL	During As- sessment of Trigger	
of Level	1 - 30 Days	> 30 Days			Tasks	
1926.62(d) - Exposure Assessment and interim Protection 1926.62(h) - Housekeeping 1926.82(f)(5) - Handwashing Facilities 1926.62(f)(1)(f) - Hazoom Training (and/or 1926.21 - Safety Training and Education)	1926.62(d)(4); Monitoring Representative of Exposure for Each Exposed Employee  1926.62(j)(1)(j) - Initial Medical Surveitance  1926.62(j)(2)(ii) - Follow-up Blood Sampling  1926.62(k) - Temporary Removal Due to Elevated Blood Lead  1926.62(k)(1)(ii)-(iv) - Information and Training	t926.52(j)(1)(ii) - Medical Surveil- tance Frogram 1926.52(j)(3) - Medical Exams and Consutation (if required)	1928.62(a) - Engineering and Work Practice Controls 1926.62(f) - Protective Clothing and Equipment 1926.62(f) - Hyglene Facilities and Practices 1926.62(m) - Signs	1926-62(g)(2) Clean Protec- tive Clothing Daily	1928.62(f) - Appropriate Respiratory Protection 1926.62(g) - Protective Clothing and Equipment 1926.62(f)(2) - Change Areas 1926.62(f)(5) - Handwashing Facilities 1926.62(f)(1)(f) - Biological Monitoring 1926.62(f)(1)(f) - Hazcom Training 1926.62(f)(2)(ff) Respirator Training 1926.21 - Safety Training and Education	

Table 1

---End of Section---

**Back to Paragraph 3.1.11** 

**Return to Section** 

## Section 02 84 16 Handling of Lighting Ballasts and Lamps Containing

The following Mercury Containing Bulbs paragraph shall be included in Spec Section 01 74 19, Construction and Demolition Waste Management in all projects:

"3.4.? Mercury Containing Light Bulbs: Mercury containing light bulbs such as mercury vapor, metal halide, high pressure sodium, and fluorescent light bulbs, or any other mercury-containing light bulbs shall be considered and handled as hazardous waste for recycle. The contractor shall collect these old/used bulbs or tubes and very carefully deliver them to the DPW-PPOC yard before the time of demolition of old buildings or a section of a building. For disposal and recycling of these bulbs, have the Contracting Officer's representative contact the DPW-PPOC yard hazardous waste supervisor before delivery to the yard so that packaging requirements for transport of the bulbs can be determined."

**Return to Designer Instructions** 

## TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 03 Concrete

SECTION 03 30 00 Cast-In-Place Concrete

Section: Appendix DD

## Ft. Campbell Requirements:

Concrete used in masonry bond beams should be 9/11 slump and contain plastiziser.

Concrete shall use Class F fly ash as the pozzolanic cement replacement.

To accommodate environmental Radon protection, all specification items identified as "vapor barrier" shall be modified to read "vapor/radon barrier"

## TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 04 Masonry

Section 04 20 00 Masonry

## Ft. Campbell Requirements:

All exterior split faced units shall be fabricated with integral water repellant and shall be integrally colored during manufacture. Water repellant primer and stain shall also be applied to all exterior split faced CMU after completion of exterior work and split face is not subject to damage by construction activities.

Block filler shall be used on all exposed CMU.

For new construction, pre-engineered metal structural frames/buildings shall not be structurally tied to masonry. If tied, frame deflection must be limited to L/600, which increases steel frame cost to the point which it exceeds the cost of a <u>designed structure</u>. This fact has been verified by metal building manufacturers, and precludes perceived advantages of pre-engineered structural systems.

Modify specifications section 04200, Masonry, to incorporate the following paragraphs, specifically including all items highlighted in red:

See Appendix D: Exterior Finishes.

## 2.4.2.1 Architectural Units

Units shall have patterned face shell. Face shell pattern shall be [fluted] [vertical scored] [split ribbed] [\_\_\_\_\_]. All exterior architectural units shall be fabricated with integral water repellant and shall be integrally colored during manufacture. Water repellant primer and stain shall also be applied to all exterior architectural CMU walls after completion of exterior work and when the masonry is not subject to damage by construction activities.

Units shall be integrally colored during manufacture. Color shall be [\_\_\_\_\_]. Patterned face shell shall be properly aligned in the completed wall.

## 2.10 MORTAR

Section: Appendix DD

Mortar shall be Type [S] [N] in accordance with the proportion specification of ASTM C 270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate; when masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Mortar for prefaced concrete masonry unit wainscots shall contain aggregates with 100 percent passing the 2.36 mm No. 8 sieve and 95 percent passing the 1.18 mm No. 16 sieve. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source. Efflorescence testing of mortar shall be in accordance with ASTM C 67. Any component causing efflorescence shall be rejected.

## **2.11 GROUT**

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 200 and 250 mm. 8 and 10 inches. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements. Efflorescence testing of mortar shall be in accordance with ASTM C 67. Any component causing efflorescence shall be rejected.

### 3.26.3 Efflorescence Test

Brick, split faced and scored CMU which will be exposed to weathering shall be tested for efflorescence. Tests shall be scheduled far enough in advance of starting masonry work to permit retesting if necessary. Sampling and testing shall conform to the applicable provisions of ASTM C 67. Units meeting the definition of "effloresced" will be subject to rejection.

**Return to Table of Contents** 

## **TECHNICAL DESIGN GUIDE**

## CHAPTER 3 Technical Requirements and Instructions Division 05 Metals

Section 05 50 13
Miscellaneous Metal Fabrications

## Ft. Campbell Requirements:

Section: Appendix DD

Avoid painted handrailings and guardrails. Use unpainted galvanized (exterior), stainless steel or aluminum railings (interior).

## TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 06 Wood, Plastics, and Composites

## SECTION 06 20 00 Finish Carpentry

## Ft. Campbell Requirements:

Use finished or painted wood trim instead of plastic for chair rails, and other decorative locations.

DPW is using wood veneer casework instead of plastic laminate on O&M projects. Hollow metal interior doors shall be used in barracks buildings.

## SECTION 06 61 16 Solid Polymer (Solid Surfacing) Fabrications

## Ft. Campbell Requirements:

Prefer using solid surfacing on counter tops and possibly on windowsills for more scratch and stain resistance.

**Return to Table of Contents** 

## TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 07

Thermal and Moisture Protection

## **SECTION 07 24 00 Exterior Insulation and Finish Systems**

## Ft. Campbell Requirements:

Section: Appendix DD

Exterior Insulating Finish Systems (EIFS): EIFS may be used as an exterior finish material only in limited applications. Building envelope finishes shall be predominantly brick, split-face block or metal panels (in industrial or otherwise approved land use areas). Unless otherwise approved, EIFS applications shall not exceed 20% of the total exterior building surface, and shall not be applied at grade or in other locations where the material is subject to damage from lawn mowing activities or is easily accessible to vandalism.

## SECTION 07 31 13 Asphalt Shingles

## Ft. Campbell Requirements:

Shingles shall be of simple seal-down 3-tap design. Use only light colors, and maximum life quality. Minimum slope for shingles shall conform to manufacturer recommendations.

Flat built-up roofs are not to be utilized in new roof system designs. Minimum low slope for roofs shall be  $\frac{1}{2}$  inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## Section 07 42 13 Metal Wall Panels

## Ft. Campbell Requirements:

Metal panel siding may be used in industrial land use areas. Use of metal panel siding in other land use areas must be approved.

## SECTION 07 51 13 Built-up Asphalt Roofing

## Ft. Campbell Requirements:

Flat no-slope built-up roof systems are to be utilized in new facility designs by approved exception only.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## SECTION 07 52 00 Modified Bituminous Membrane Roofing

## Ft. Campbell Requirements:

Flat no-slope built-up roof systems are to be utilized in new facility designs by approved exception only.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## **Return to Table of Contents**

## SECTION 07 53 23 Elastomeric Roofing (EPDM)

## Ft. Campbell Requirements:

Flat no-slope built-up roof systems are to be utilized in new facility designs by approved exception only.

Minimum low slope for new roofs shall be  $\frac{1}{2}$  inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## SECTION 07 61 14.00 20 Steel Standing Seam Roofing

### Structural:

## Ft. Campbell Requirements:

Metal roofing shall be vertical seam with ASTM E 1592 uplift approval.

Color shall conform to Ft. Campbell approved standard schemes. See Appendix D

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

## **Non-Structural:**

## Ft. Campbell Requirements:

Metal roofing shall be vertical seam and meet UL class 90 uplift approval.

Color shall conform to Ft. Campbell approved standard schemes. See Appendix D

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

**Return to Table of Contents** 

## TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 08 Openings

Section 08 33 23
Overhead Coiling Doors

## Ft. Campbell Requirements:

Door manufacturer representative shall conduct a final inspection of the door installation(s) and certify the installation is complete and correct, and meets all requirements for the full warranty.

## **Instructions to Designers:**

- 1. Modify UFGS 08331 paragraphs to include the on-site visit and verification requirement.
- 1. Modify the UFGS 08331 paragraphs to include a certification of inspection by the door manufacturer representative.

## SECTION 08 36 13 Sectional Overhead Doors

## Ft. Campbell Requirements:

Door manufacturer representative shall conduct a final inspection of the door installation(s) and certify the installation is complete and correct, and meets all requirements for the full warranty.

## **Instructions to Designers:**

- 1. Modify UFGS 08360 paragraphs to include the on-site visit and verification requirement.
- 2. Modify the UFGS 08360 paragraphs to include a certification of inspection by the door manufacturer representative.

## **Return to Table of Contents**

## SECTION 08 71 00 Hardware

## Ft. Campbell Requirements:

Fort Campbell utilizes an "I/C - 7 pin Insta-Key" integrated master keying system. Interchangeable cores provided shall be compatible with the existing "I/C - 7 pin Insta-Key" system. The I/C - 7 pin Insta-Key keying system is the standard key system for all building types. Biting list is to be added to keying schedule. Both list and control keys are to delivered to the post lock smith office at building turnover. Four blank keys are to be provided with each change key.

Electric locks shall be stand alone Stanley Security Solutions BASIS "G" system with encoders as required on all troop housing projects and all NEC communication rooms. (See Attachment at end of this section for ordering data). All key over-rides - see Insta-Key requirements above.

All locks are to be GRADE 1 and be 7-SFICprepped for Insta-Key cores.

*Unless otherwise dictated by ADA*, Prefer knobs instead of levers on all non-troop housing projects.

Panic device hardware shall be touch pad type. Avoid concealed and surface mounted vertical bars and use of rim or mortise exit devices with removable mullions.

Install kick plates on doors in heavy use areas.

Concealed door closers shall not be avoided without prior DPW approval.

Require door stops at all interior and exterior locations.

Mechanical/ Electrical room doors shall be equipped with *Insta-Key 5DPW.1* as the keying standard. Communication room doors shall be equipped with *Insta-Key 1FZ.1* as the keying standard.

Secured areas shall be secured with S&G 2740 or X-09 using LKM7000 series hardware for pedestrian door mounting. COMSEC vaults utilize the same combination lock choices without the LKM7000 series. Arms Room vaults utilize S & G 2937 combination locks.

## **Instructions to Designers:**

- 1. Modify specifications paragraphs to include each of the above features as they apply to the project.
  - 1. The Installation POC regarding keys and locks is Mr. Ayers (270) 798-3581, robert.b.ayers@us.army.mil.
  - 2. Basis G Aplications Regional Representative is Pete Graham (502) 439-7115, pgram@stanleyworks.com.

Ref: Basis G Electronic Locksets

The following is the list of part numbers for the battery operated electronic Locksets for the barrack doors. All locks are designed for standard 1-3/4" thick doors.

The locks can use the government issued I.D. card. These locks will use track 3 of the magnetic stripe.

Barracks Doors - These are the (3) types of magnetic stripe card readers with lever handle trim.

Cylindrical — 93KG7DVI5MS-S3-626

Mortise - 45HG7DV15MS-HAND-626

Exit Device — EXG7EV1 5MS-626-HAND-MANUF.-TYPE, and when mounted on glass doors, insure the door's are wide stile glass doors.

Page 663 of 947

Example: EXG7EV1 5MS-626-RHR-PH2-RM

Specify one each of the following Manuf. and Type in part number above for exit device trim:

MANUF.- Precision — PHI or PH2

Section: Appendix DD

Von Duprin 99 — VD9

Sargent 8000 — SA8 — only available for rim device

TYPE-Rim -RM
Mortise - MO
Vertical Rod VR

The The Basic G exit trim through bolts to Precision 1000 or 2000 series, Von Duprin 99 series or Sargent 8000 series. These will work with either rim or mortise devices. The exit device trim will work with either the night latch or classroom function devices.

Attachment Page 1/2

The programming equipment for the locksets and for encoding your 1.0. cards, you will need the following part or service:

Basis G - BAS-SWS-G - for server - Programming Software

- BAS-SWC-G for each additional user location Programming Software
- BASD-CAB Programming Cable, connects to lockset
- VPD-T15 Driver Bit, for battery compartment
- VPD-CLN Magnetic stripe reader cleaning cards (bx 50)
- BASD-MSE- Magnetic stripe card encoder and software
- HP-PDA Netbook/PDA programming device
- HP-PDA-CAB- Netbook/PDA programming cable connects to BASD-CAB.
- VPD-BB Replacement battery pack for Basis G lock (50 batteries).

VPA-PVC - Magnetic stripe cards, non-encoded (bx 500)

## **Return to Table of Contents**

## TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 09 Finishes

<sup>\*</sup> For high traffic exterior and common doors you will want to hardwire the access control devices such as panic bars, locksets, electric strikes, etc. and use the Basis ET605 System to integrate the Basis G database.

## SECTION 09 06 90 Color Schedule

## Ft. Campbell Requirements:

Exterior and interior finish colors shall conform to Appendix D.

## SECTION 09 90 00 Paints and Coatings

## Ft. Campbell Requirements:

Use of semi-gloss, eggshell, and other enamelized paint finishes shall be maximized. Use of flat paints shall be minimized.

# TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 10 Specialities

## SECTION 10 14 01 Exterior Signage

## Ft. Campbell Requirements:

Exterior signage shall be fabricated and installed per CAM Reg 420-6.

All signs shall be installed in accordance with the most recent Manual on Uniform Traffic Control Devices (MUTCD). The materials used shall conform to the Kentucky Transportation Cabinet's specification for reflectivity (ASTM D 4956, Types III, IV, VIII, IX, and XI). The aluminum sheeting used in fabricating the signs shall also conform to the Kentucky Transportation Cabinet's specifications. The sign post shall be break away 1 3/4 inch square galvanized steel tubing in a 2 inch square galvanized steel socket.

Projects that include new roads, shall also include street signage in the construction contract.

## Instructions to Designers:

1. Incorporate the above Fort Campbell requirements into the project specifications.

## **Return to Table of Contents**

## SECTION 10 14 02 Interior Signage

## Ft. Campbell Requirements:

If "addressable" fire alarm system is not used for a building, provide a building map identifying fire alarm zones and mount on wall next to fire alarm system panel.

Interior Designer shall (re)number building spaces for "wayfinding" and provide the information to signage subcontractor on construction drawings.

When interior signage is renumbered from the construction drawing room numbering sequence to accommodate "wayfinding", provide original construction drawing room number in metal slot mounted above door of each room for fire and maintenance purposes when construction drawings typically would be referenced. This confusing problem can be overcome by having "wayfinding" numbering from the beginning of design.

## SECTION 10 21 13 Toilet Compartments

## Ft. Campbell Requirements:

Use of solid phenolic partitions is encouraged.

## SECTION 10 28 13 Toilet Accessories

## Ft. Campbell Requirements:

Accessories shall not have keyed locking devices.

Toilet tissue dispensers shall be a simple design similar to Bobrick Washroom Equipment, Inc. number B-685 and B-686 series accessories.

Trash receptacles provided in restrooms shall have lids.

Sanitary napkin and tampon dispensers shall not be provided.

## **Return to Table of Contents**

# TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 11 Equipment

Section 11 44 00 Food Cooking Equipment

## Ft. Campbell Requirements:

Kitchen facilities that use deep fat frying equipment should have equipment for extracting and storing the used cooking oil.

# TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 13 Special Construction

Section 13 34 19 Metal Buildings

## Ft. Campbell Requirements:

For new construction, pre-engineered metal structural frames/buildings shall not be structurally tied to masonry. If tied, frame deflection must be limited to L/600, which increases steel frame cost to the point which it exceeds the cost of a <u>designed structure</u>. This fact has been verified by metal building manufacturers, and precludes perceived advantages of pre-engineered structural systems.

See Appendix D for colors.

See: TI 809-30, Metal Building Systems

## SECTION 13281 Lead Hazard Control Activities

## Ft. Campbell Requirements:

Lead Abatement shall be accomplished in accordance with Fort Campbell requirements identified in specification section 02090: Removal and Disposal of Lead Containing Materials

Section 02090 requirements should be combined and incorporated into the UFGS 13281 section, or the Section 02090 may be renumbered. Requirements of both sections should be coordinated.

# Return to Table of Contents TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 22 Plumbing

Section 22 00 00 Plumbing, General Purpose

## Ft. Campbell Requirements:

Water lines and gas lines shall not be used for electrical grounding.

## Water Supply:

 Testing – Conduct sterilization/flushing of new water lines. Perform bacteriological testing of new water lines. See <u>Ft. Campbell Water Distribution System</u>.

## Fixtures:

Faucet fixtures shall be metal and not plastic.

## Drains:

- Be sure equipment drains are sized properly.
- No HVAC drain lines are to be connected to oil/water separators.

## Waste:

 Cast iron pipe is preferred under building slabs for waste lines due to its service life and durability. PVC will be considered by Fort Campbell for approval if adequate design information is provided by designer as to its strength and service life.

## Grease Traps:

 Provide access (i.e. a way for a pumper truck to drive right up to the trap) for maintenance and periodic pump out.

## Isolation Valves:

• Provide adequate isolation valves to ensure repairs can be made with minimal impact on the facility occupants.

## Preferences:

Item	Manufacturer	Model/Remarks
Comode, flush type	Kohler	1.6 gl with 3.5 gl manual
		Sloan flush valve
Comode, tank type	Mansfield	135 bowl, 160 tank bottom
Faucet, lavatory	Delta	Single handle
Faucet, shower	Simmons	Model 2000 Temp Troll
Urinal	Kohler	Manual Sloan flush valve
Water Cooler, floor mount	Sunrock	
Water Cooler, wall mount	Sunrock	

## **Backflow Preventers:**

Locate in a visible location with full access to the device for component removal and service no more than than 4 feet above the floor.

Devices must be installed far enough away from walls and other equipment to allow service and repair (nominally 1 foot clearance on either side and 3 feet of clearance top and bottom) such that testing or repair can be performed without interference from adjacent equipment or building structure.

Reduced Pressure Backflow Preventer (RPBP) and Double Check Backflow Preventer (DCBP) devices should be equipped with test cocks.

Testable RPBP and DCBP devices should be equipped with strainers except in fire suppression systems.

All backflow devices must be installed horizontally unless the device is specifically designed for vertical installation.

RPBP relief valves must be vented to a drain of sufficient capacity to handle the full discharge flow of the relief valve.

Large RPBP devices (3"D or greater are best vented to the outside unless a large floor drain with sufficient capacity is available.

Preferred devices include: Watts Regulator Inc., Zurn-Wilkins Inc., or Ames Corporation

RPBP devices must not be installed underground where they are susceptible to flooding. If an outdoor location is required, install the backflow preventer in an insulated box with a heat plate for freeze protection.

Point of Contact for backflow prevention is Gary Sewell in Utilities Management Branch at 270-798-5640.

ALL personnel involved with "backflow devices" shall be Tennessee/Kentucky certified in backflow devices. Contractors shall be required to qualify as a licensed Tennessee/Kentucky "Master Plumbers" Contractor. DPW personnel installing, maintaining, or inspecting will also need to obtain and maintain the Tennessee certification (Master Plumber is optional). Tennessee offers training at no cost at it's training center in Murfreesboro several times a year. Initial training is 4 days, renewal training is 2 days.

Atmospheric Vacuum Breaker Devices (AVB) should be installed with no valves downstream. A minimum of 6 inches must be provided above all downstream piping and flood level rim of receptor (hose bib, sink faucet, etc.).

Consider parallel devices where shutdown for inspection and maintenance is not feasible.

Devices shall have individual serial numbers. Numbers are needed to track a device to ensure it is not relocated or another type of device is installed. This is verified on the annual inspections/testing.

The following are backflow applications and recommended devices:

Building Feed	RPBP	High Hazard
Building Bypass	RPBP	High Hazard
Boiler Make up water	RPBP	High Hazard
Chiller Make up Water	RPBP	High Hazard
Wash Water Systems	RPBP	High Hazard
Dynamometers	RPBP	High Hazard
Film Developers	RPBP	High Hazard
Fire Systems w/ chemicals	RPBP	High Hazard
Water Conditioners	RPBP	High Hazard
Chemical Feed Tanks	RPBP	High Hazard
Pump Seal Flush	RPBP	High Hazard
Sewage Plant Connections	RPBP	High Hazard
Compressor Cooling Water	RPBP	High Hazard
Building Feed	DCBP	Intermediate Hazard
Building Bypass	DCBP	Intermediate Hazard
Garbage Disposal	DCBP	Intermediate Hazard
Irrigation Systems	DCBP or P	VB Intermediate Hazard
Ice Machines	DCBP	Intermediate Hazard
Steam Cookers	DCBP	Intermediate Hazard

Page 670 of 947

Drink Machines DCBP Intermediate Hazard Dental Utility Boxes DCBP Intermediate Hazard

Mop Sink AVB Intermediate Hazard
Hose Bibs AVB Intermediate & Low Haz.
Laboratory Sinks AVB Intermediate Hazard
Dishwashers AVB Intermediate & Low Haz.
Kitchen Wash Sink AVB Intermediate Hazard

Abbreviation: Type of Device:

Section: Appendix DD

RPBP Reduced Pressure Backflow Preventer
DCBP Double Check Backflow Preventer

PVB Pressure Vacuum Breaker AVB Atmospheric Vacuum Breaker

**Army Energy Program:** Section 2, Executive Order 13423 states "(a) Improve energy efficiency …through reduction of energy intensity by 3% annually…", "(c) Beginning in FY 2008, reduce water consumption intensity…by 2 percent annually…".

## Vehicle Maintenance Facility Lubrication Systems

- 1. No compression fittings, valves or screw joints above a 6' working height. Joints above 6' should be welded or soldered to prevent leaks. Joints should be pressure tested for leaks.
- When a piston pump is installed in a drum, install "drybreak" quick disconnect fittings on air and supply hoses.
- 3. Ensure all lines are properly labeled with product.
- 4. Air filters and lubricators should be installed in the supply line coming from the air compressor at a working height not greater than six feet.
- 5. Ensure only 120lb grease pump packages are installed.

**Return to Table of Contents** 

## TECHNICAL DESIGN GUIDE CHAPTER 3

Technical Requirements and Instructions
Division 23
Heating, Ventilation, and Air Conditioning

Section 23 00 00 Air Supply, Distribution, Ventilation, and Exhaust Systems

## Ft. Campbell Requirements:

Solvent cleaning in Arms Rooms - adequate ventilation a concern. Ventilate arms vaults at a rate of 0.1 CFM / Sq.Ft. minimum at all times. Provide separate manually operated ventilation at the rate of 0.5 CFM / Sq.Ft. during solvent cleaning.

Provide balancing dampers in all branch ducts feeding diffusers. Do not use volume dampers at diffusers for balancing because the noise created by a throttled damper at the diffuser is not attenuated.

Avoid over estimating cooling loads and cooling air flow to spaces. Doing so causes high space humidity, especially at part load cooling conditions. Refer to the appendix titled Mold and Humidity for air system considerations with regard to achieving good space humidity conditions.

Size cooling coils handling outdoor air for the design dry bulb temperature day, or the design humidity day which ever gives the greater coil capacity.

Provide dial type thermometers at air handlers to indicate the temperature of the supply air, return air, outdoor air, and mixed air.

Provide pressure gauges at air handlers to measure the supply duct pressure, the filter differential pressure, and the fan differential pressure.

Preferences: Air conditioners - Trane.

## **Return to Table of Contents**

## Section 23 05 93 Testing, Adjusting, and Balancing for HVAC

## Ft. Campbell Requirements:

Require the technician to measure, balance, and report the building pressure relative to atmosphere.

Where VAV systems are employed, require measurement of the building pressure at full air flow and at minimum air flow.

If a VAV system is used, the designer must carefully consider the mounting location of each VAV box. The VAV boxes must be easily accessible from a step ladder. They should be

located so that moving furniture is not necessary. VAV boxes must not be located high above a suspended ceiling; this makes access nearly impossible. Designers must show the mounting height and insure access to all sides of the VAV boxes.

## SECTION 23 07 00 Thermal Insulation for Mechanical Systems

## Ft. Campbell Requirements:

Section: Appendix DD

Do not use all service jacket (ASJ) in humid or unconditioned spaces. The adhesive on this product does not hold in high humidity conditions.

Do not use fiberglass outdoors or anywhere insulation may get wet.

Provide metal or PVC covering over piping or equipment insulation in spaces that are not air conditioned (cooled); mechanical rooms and storage rooms are examples.

## Section 23 08 00.00 10 Commissioning HVAC Systems

## Ft. Campbell Requirements:

All projects, MILCON and OMA and other funding sources, shall be executed using commissioning procedures and processes per the COE specification.

Any special tools, computers, software, etc., required for operations and maintenance of the new equipment that will assist maintenance personnel maintain the facility shall be turned over to the contracting officer.

Specify training for DPW personnel. Training shall be given by factory authorized personnel.

## **Return to Table of Contents**

## Section 23 09 23.13 20

<u>Lonworks Direct Digital Control for HVAC and Other Building Control</u>
Systems

## Ft. Campbell Requirements:

Section: Appendix DD

## **General Requirements:**

Provide system control schematic diagrams for each system indicating all required sensors, actuators.

Indicate the valve coefficient, Cv for each control valve.

Locate Freeze stats downstream of the heating coil and be sure manufacturer approved mounting is specified.

Electric actuators are to be oil immersed gear actuated or Belimo type. Do not use electrohydraulic actuators.

Provide actuator position feedback to the DDC for monitoring the position of all valves and dampers.

Be sure conduit enters the control panel from the bottom only.

Specify that all wiring leaving the panel must be landed on a terminal strip separate from the control devices.

Provide control panel with hasp and pad lock in lieu of the panel lock. Pad lock shall be keyed same as the room door.

Do not use a personal computer (PC) as a router to convert from one protocol to another.

PCs should be used as the interface to the system, not as a required component in the network.

Show the location of the control panels on the drawings.

Provide laminated control diagrams in the control panel.

## **EMCS Requirements**

Include the following provisions in the specification, However do not include the notes to the designer in the specifications:

Connection to the Energy Management and Control System (EMCS)

The equipment installed under this section must be compatable with the EMCS described in Section 25 10 10 Lonworks Utility Monitoring and Control System.

The control inputs and outputs, the schedules, and the alarms to be transmitted shall be as shown on the drawings.

Note to the Designer: On the drawings, in addition to the system control schematics, and sequences of operation, provide a table showing for each system indicating the inputs, outputs, trends, schedules and alarms to be available at the EMCS. Refer to the section below titled EMCS Points for the minimum required points to be made available at the EMCS.

A personal computer (PC) type workstation shall be provided at the building if specified or shown on the drawings for use as a local interface to the building controls.

A personal computer (PC) shall not be used as the building interface to the EMCS, nor shall a PC be used to convert protocol used by the building controllers.

Notify the Contracting Officer 4 weeks in advance of the building connection to the post Ethernet and coordinate with the Directorate of Public Works (PWC) point of contact for Information Technology (IT) issues. The DPW contact is Tim Foe, phone 270-798-6716.

DPW will provide IP addresses, install anti-virus software on any building workstations, and coordinate with Fort Campbell Information Technology Business Center (ITBC) concerning the connection to the post Ethernet.

## EMCS Requirements on Design / Build Projects:

Section: Appendix DD

Include the following words in the Request for Proposal (RFP) in the section dealing with building controls. However do not include the notes to the RFP author in the RFP: The HVAC control system shall be a direct digital control (DDC) system meeting the requirements of and installed in accordance with [Unified Facility Guide Specification UFGS-15951 Direct Digital Controls][Specification Section 15951 Direct Digital Controls]. The equipment shall be limited to the options contained within the specification. The connection shall provide the ability to do the following from the existing central workstations: monitor and control inputs and outputs, revise equipment schedules, override schedules, view trend data collected and stored at the building controllers, set up trends at the workstation, and receive alarms from the building controllers.

The connection shall use the existing post Ethernet network as the data transmission media.

The contractor shall be responsible to complete the connection and system integration of the building controls to the existing EMCS including all required programming of the building controls.

Note to the RFP author: Include a list or table showing typical inputs, outputs, schedules, and alarms to be transmitted to the EMCS, and trends to be maintained by the building controls and available to the EMCS. Include the position of all damper and valve actuators as an input available at the EMCS. Refer to the section below titled EMCS Points for the minimum required points to be made available at the EMCS.

A portable workstation / tester (lap top type computer) shall be provided with controls set up and diagnostic software installed. This device shall serve as a tool for the maintenance staff to access and modify the controls configuration.

Notify the Contracting Officer 4 weeks in advance of the building connection to the post Ethernet and coordinate with the Directorate of Public Works (PWC) point of contact for Information Technology. The DPW contact is Tim Foe, phone 270-798-6716. DPW will provide IP addresses, install anti-virus software on [any building workstations and on] the portable workstation / tester service tool and coordinate with Fort Campbell Information Technology Business Center (ITBC) concerning the connection to the post Ethernet and opening the communication port.

Inputs and outputs (points) to be connected to the Energy Monitoring and Control System are given below. The designer or author of the RFP should be sure that the procurement documents require that these points are available at the EMCS as a minimum. Abbreviations that may be used in this section are as follows:

Al – analog input

Page 675 of 947

AO – analog output

CSR - current sensing relay

Section: Appendix DD

DI – digital input

DO – digital output

dP - differential pressure

EMCS - Energy Monitoring and Control System

HVAC - Heating Ventilating and Air Conditioning

KW - Kilowatt

LAN – local area network

MZ - Multizone

SZ – Single Zone

VAV - Variable Air Volume

## **Ethernet Hub and Communication Cable**

Verify that there will be an Ethernet hub within the building. This serves as the connection to the EMCS.

New instrumentation and controls such as sensors, control relays, and status indication will be connected to the EMCS. The following is a recommended summary of the minimum EMCS points to connect. Some of the listed equipment may not be used on this project. Some equipment may be missing. However, this list should give a feel for the types of points to connect. Note that some of the points such as damper or valve actuator position may not be needed by the building controls. Such points would be monitoring points.

Air Handler Units - Single Zone, VAV, and Multizone

Digital Outputs:

Start / Stop signal

Vent Delay signal. This is used to disable the outdoor air damper during morning warm up (or cool down) before the building occupants arrive. It is not required if the local controls are taking care of this function.

Analog Outputs: None

Digital Inputs:

Fan on / off status via dP switch is the preferred method. CSR is second preference.

Differential pressure switch across filters.

Economizer status.

Freeze stat status.

Duct Smoke detector status.

Analog Inputs:

Supply air temperature.

Hot deck temperature for MZ units.

Cold deck temperature for MZ units.

Return air temperature.

Mixed air temperature. Add the sensor if it is not part of the normal controls.

Damper positions.

Valve positions.

Space temperature.

Space humidity where sensors are installed for humidity control.

OA temperature sensors will not be added or connected. OA temperature is currently monitored by the EMCS at a central location.

Alarms:

AHU fan failure to start

AHU fan failure to stop

Return Temperature High

Return Temperature Low

Space Temperature High

Space Temperature Low

Mixed Air Temperature Low

Freeze stat Trip Smoke condition

Trend: Data is stored at the building controller

Space temperature Space humidity

Supply Air Temperature

VAV Boxes (applies to normal pressure independent VAV boxes)

Digital Outputs: None

Analog Outputs:

Space temperature set point adjustment.

Digital Inputs:

Fan Status, if the box is fan powered.

Analog Inputs: Space Temperature

Air Flow through the primary air damper

Damper position
Valve position
Alarms: None
Trend: None
Hot Water Boiler

Digital Outputs:

Control Relay to disable the boiler.

Analog Outputs: None.

Digital Inputs:

Boiler (burner) status will be included.

Analog Inputs:

Hot water supply temperature to the building. Hot water return temperature from the building.

Alarms:

Boiler trouble alarm from ignition controls

Hot leaving temperature high Hot leaving temperature low

Trend: Data is stored at the building controller

Hot water supply temperature Hot water return temperature Steam to Hot Water Converter

Digital Outputs:

Control Relay to disable the steam valve.

Analog Outputs: None. Digital Inputs: None.

Analog Inputs:

Page 677 of 947

Converter entering water temperature.

Converter leaving water temperature.

Alarms:

Hot leaving temperature high

Section: Appendix DD

Hot leaving temperature low

Trend: Data is stored at the building controller

Hot water supply temperature

Hot water return temperature

Chillers

Digital Outputs:

Enable / Disable Signal.

Analog Outputs:

Chilled water set point adjustment.

Digital Inputs:

On / Off Status.

Chiller failure alarm: This is to indicate when there is a local chiller alarm. The specific condition causing the alarm need not be transmitted. The goal is to know when the chiller is in need of service.

Analog Inputs:

Chilled water supply temperature from the chiller to the building.

Chilled water return temperature from the building to the chiller.

Condenser water inlet temperature.

Condenser water outlet temperature.

Alarms:

Chiller failure signal from chiller packaged controls

Failure to stop after Disable command

Trend: Data is stored at the building controller

Chilled water supply temperature

Chilled water return temperature

Condensing Units

Digital Outputs:

Enable / Disable Signal. The signal serves to override the local automatic controls to force the condensing unit to stop.

Analog Outputs: None.

Digital Inputs:

On / Off Status via a CSR or interface to the on-board controls.

Analog Inputs: None.

Alarms:

Failure to stop after Disable command

Trend: None

**Pumps** 

Digital Outputs:

Enable / Disable signal to override the local motor controls and force the pump to stop even if the motor starter is in the HAND position.

Analog Outputs: None.

Digital Inputs:

Pump on / off status; by a dP switch or by CSR.

Page 678 of 947

Analog Inputs: None.

Section: Appendix DD

Alarms:

Failure to start.
Failure to stop.
Trend: None
Occupied Space

Digital Outputs: None Analog Outputs: None. Digital Inputs: None.

Analog Inputs:

Space temperature. Use VAV box sensors where possible. Use space sensors included for the control of air handlers where possible. In this case the space temperature may be shown as a point associated with the air handler. Additional space sensors may be added if necessary.

Alarms:

Space temperature high Space temperature low

Trend: Data is stored at the building controller

Space temperature

Computer Room Units (such as Liebert units)

Digital Outputs: None. Analog Outputs: None. Digital Inputs: None. Analog Inputs: None.

Alarms:

Trouble or failure signal from the packaged controls.

Trend: None Make-up Air Units

As a rule, there is no EMCS control of the process exhaust equipment such as kitchen hoods. Likewise there will be no EMCS control of the associated make up air equipment serving kitchen hoods. However, where space sensors in the areas served by the makeup air units are connected to the DDC, these will be included and connected to the EMCS.

Digital Outputs: None Analog Outputs: None.

Digital Inputs: On / Off Status. Analog Inputs:

Space Temperature where this sensor is interfaced to the DDC.

Trend: None

Infrared Gas Heaters
Digital Outputs: None.
Analog Outputs: None.
Digital Inputs: None
Analog Inputs:

Space Temperature.

Alarms: None Trend: None

Page 679 of 947

Preferences: Building Control Systems: Honeywell or Johnson Controls.

## **Return to Table of Contents**

## Section 23 09 53.00 20 Space Temperature Control Systems

## Ft. Campbell Requirements:

Section: Appendix DD

Provide a location for injecting chemical inhibitors into the system.

Provide a location for pulling water samples.

Provide strainers to remove solids from system.

Avoid using glycol systems. If a glycol system must be used, provide a means to flush the system and show it on the drawings.

Avoid the use of Dual Temperature piping systems.

Install expansion tank valves and unions so the tank can be isolated from the system for maintenance. Valves are to be mechanically tied down so they cannot be inadvertently closed. Provide a drain line and valve connected to the piping between the isolation valve and the expansion tank for draining the expansion tank in order to check the air pre-charge.

Show the required air pre-charge pressure on the drawings.

Install valves and unions to isolate individual equipment. Install valves to isolate individual buildings on central systems servicing several buildings..

Size balance valves to have about 1 psi pressure drop wide open so that they will not operate nearly closed to achieve the necessary flow restriction in the system.

Specify gate valves or ball valves in lieu of butterfly valves.

Avoid valves that function as a combination check, balance, and isolation valve all in one. These triple duty type valves compromise each function. Provide separate valves. Remove triple duty type valves from the specifications.

Detail and specify vents at all trapped high points in the piping.

Detail and specify drains at all trapped low points in the piping.

Use dial type thermometers installed in thermo wells.

Provide spare thermo wells at each temperature sensor.

Section: Appendix DD Page 680 of 947

Use oil filled dial type pressure gauges.

Where domestic water is used for system make-up, use a reduced pressure backflow preventer in the make-up line.

Use separate backflow preventers on the make-up lines to the chilled water and the hot water systems. Otherwise cross flow between the systems can occur (even if check valves are used).

## **Return to Table of Contents**

## Section 23 35 00.00 10 Overhead Vehicle Tailpipe (and Welding Fume) Exhaust Removal Systems

## Ft. Campbell Requirements:

The designer must verify the type of vehicles being serviced. Large diesel engine driven vehicles can require an exhaust volume much higher than the typical 400 to 600 CFM vehicle exhaust system can handle.

Before sizing the exhaust system components, determine the engine displacement, the engine speed while being run on the exhaust system, whether or not the engine is turbocharged, and whether the engine is operated loaded or unloaded at high idle speed.

## Section 23 52 00 **Heating Boilers**

## Ft. Campbell Requirements:

Environmental Air Quality requirements apply. See Appendix A, Environmental Topics.

Install fire tube boilers in lieu of sectional boilers.

The use of copper-finn tube boilers is not acceptable.

Install emergency boiler shutoff (push button) switches just inside mechanical room door.

In converters, use stainless steel converter tubes instead of copper.

Include manufacturer approved devices installed for testing samples of water and steam in the system (both in the mechanical room and at the ends of the system).

For Steam regulators, use Leslie regulator.

At the steam entrance into a building, install a double-block-and-bleed valve arrangement for positive isolation and venting of the steam during maintenance of the downstream system components.

For oil containing equipment, design a containment curb under the equipment.

Do not install equipment in pits.

Locate laminated copies of as-built drawings and control schematics in mechanical rooms.

Preferences: Water Boiler – Hesco.

Circulating Pump - Taco

## Section 23 64 10 Packaged Water Chillers, Vapor Compression Type

## Ft. Campbell Requirements:

Locate equipment to minimize piping runs.

Do not install roof-top equipment on metal or sloping roof systems.

Where direct expansion units are employed, use only manufacturer standard sized package units.

Install only manufacturer standard sized package chillers.

On outdoor package chillers, provide a circulating pump and bypass to allow flow through the chiller during the heating season (trying to keep from draining the system).

Design for the chiller to have control of the pumps for chiller freeze protection.

Install strainers upstream of chiller barrels and condenser barrels.

Install a single pressure gauge on the chiller barrel piped to read the inlet and outlet pressure.

Install a single pressure gauge on the condenser barrel piped to read the inlet and outlet pressure.

Refer to Section 15951 Direct Digital Control for DDC for the points required to be monitored and controls from the Energy Monitoring and Control System. Specify that the chiller have the capability to communicate this data.

Page 682 of 947

Preferences: Chillers: Trane

Section: Appendix DD

## **Return to Table of Contents**

## Section 23 81 00.00 10 Unitary Air Conditioning Equipment

## Ft. Campbell Requirements:

Do not install roof-top equipment on metal or sloping roof systems.

Locate equipment to minimize piping runs.

Use only manufacturer standard sized package.

## SECTION 23 81 23.00 20 Computer Room Air Conditioning Units

## Ft. Campbell Requirements:

Provide soft water for make-up.

Provide automatic blow down for humidifiers.

Oversized computer room units are common. Determining the cooling load by summing all the nameplate amp ratings of all the computer equipment will surely result in an oversized unit and cause inefficient operation. Space humidity may not be a problem only because the computer room unit has reheat capability. The unit adds enough heat to make up for the excess in airflow. Size computer room units to accommodate the actual heat release from the computer equipment; airflows will be decreased, the supply temperatures will be lower for a longer period of time, and the reheat will operate far less frequently. Always consider multiple computer room units to split the cooling load; if one unit fails, the other can keep the space at a reasonable temperature.

## Section 23 82 01.00 10 Warm Air Heating Systems

## Ft. Campbell Requirements:

Preferences: Furnaces – Trane/Carrier.

**Return to Table of Contents** 

## TECHNICAL DESIGN GUIDE CHAPTER 3

## Technical Requirements and Instructions Division 25 Integretated Automation

Section 25 10 10 Lonworks Utility Monitoring and Control System (UMCS)

#### Ft. Campbell Requirements:

Section: Appendix DD

Although this section says Lonworks, the UMCS system will be based on the Niagra Framework AX version developed by Tridium.

Refer to Sections 23 09 23.13 20 Lonworks Digital Control for HVAC and Other Building Control Systems and Section 26 27 13.10 30 Electric Meters.

Connect all new building controls to the EMCS unless directed otherwise.

Refer to Section 23 09 23.13 20 for connection requirements.

#### SPECIFICATION FOR BUILDING INTEGRATION INTO FORT CAMPBELL'S EMCS

#### **Building Integration**

Note: The terms EMCS, BAS, UMCS and FMCS shall be used interchangeably. Facilities under this contract will be integrated to an FMCS as defined.

The Facility Management and Control System (FMCS) shall be comprised of Network Area Controller or Controllers (NAC) within each facility. The NAC shall connect to Fort Campbell's wide area network. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each NAC shall communicate to LonMark/LonTalk (IDC) controllers and other open systems/devices provided. The Facility Management and Control System (FMCS) as provided will be based on the Niagara Framework AX VERSION (or "Niagara"), a Java-based framework developed by Tridium. Niagara provides an open automation infrastructure that integrates diverse systems and devices (regardless of manufacturer, communication standard or software) into a unified platform that can be easily managed.

**Return to Table of Contents** 

#### **TECHNICAL DESIGN GUIDE**

# CHAPTER 3 Technical Requirements and Instructions Division 26 Electrical

Section 26 00 00.00 20 Basic Electrical Materials and Methods

#### Ft. Campbell Requirements:

Section: Appendix DD

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any existing equipment without first securing an Electrical Permit from the Fort Campbell Electrical Inspector in accordance with CAM Regulation 420-4 (Quality Assurance "Electrical" Inspection Standards). An Electrical Contractor Registration Form must be completed. This form will be attached to the back of your copy of the CAM Regulation. Your Contractor's license will then need to be validated against the Fort Campbell Review Board list of State Electrical Licenses valid on Fort Campbell KY before you can obtain a permit. To review CAM Regulation 420-4 click here. Permits shall be obtained at DPW, Contract Management Branch Building 846, 16<sup>th</sup> Street and Georgia Ave, Fort Campbell, Kentucky.

## Section 26 12 19.10 Three-Phase Pad-Mounted Transformers

#### Ft. Campbell Requirements:

Service transformers, for all 15kV, and below, 3-phase underground fed installations, shall be of the pad-mounted type. The high-voltage compartment shall be dead-front construction. Primary switching and protective devices shall include load break switching, fuse protection, medium-voltage separable load break connectors, universal bushing wells and inserts or integral one piece bushings and surge arresters. The nameplate rating for the transformer shall not be less than 90 percent of the KVA demand load calculated for the transformer. Provide copper windings, not aluminum. Enclosure shall be lockable using a padlock. New single phase transformer installations shall utilize a pad mount transformer. Single phase installations for O&M projects shall be coordinated with user as to whether a pole mount or a pad mount transformer should be used. Designer shall coordinate with the DPW as to whether a new or replacement feed is to be run aerially or underground.

Delta banks shall not be provided for transformer stations.

Provide adjustable taps on transformers.

Page 685 of 947

Rebuilt or reconditioned transformers will be not installed.

A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.

 The following information will be provided to the construction representative to be forwarded to the Environmental Division for updating of the Fort Campbell database:

Manufacturer:
Model Number:
Serial Number
Manufacture Date:
KVA and Phase:
Primary Voltage:
Secondary Voltage:
Installation Date:
State Installed:
Location Installed:

Section: Appendix DD

Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the DPW Environmental Division should be contacted. The POC for PCB is Russ Godsave at (270) 798-9637.

#### **Instructions to Designers:**

1. Include all features into project design and contract documents specifications as they apply.

**Return to Table of Contents** 

## Section 26 20 00 Interior Distribution System

#### Ft. Campbell Requirements:

a. An Electrical Inspection is required for any electrical work, modifications, additions or upgrades to existing electrical systems in any Fort Campbell real property, temporary building or other structures, including mobile homes, temporary office trailers, recreational vehicles, floating buildings; and other premises such as yards, parking, storage, carnival, and other lots and industrial substations.

Section: Appendix DD Page 686 of 947

b. An Electrical Inspection is required for any electrical service that is to be connected to the Fort Campbell electrical network.

c. An approved Fort Campbell Electrical Contractor Registration Form is required for any person, firm or corporation requiring an Electrical Work Permit. At minimum, but not limited to, a current valid state Electrical Contractors License is required to obtain and maintain approval.

See CAM Reg 420-4, 4 April 2006 for further details click here.

Grounding shall not be accomplished at water lines. Use of ground rods is required.

Provide watt-hour meters and secondary surge arrestors on each new facility. Meters shall be capable of receiving a device to allow future remote monitoring

#### **General:**

There shall be an electrical room separate from the mechanical room to protect electrical communications and fire alarm equipment from temperature and humidity normally encountered in a mechanical room. Access to the electrical room shall be either directly from the outside of the building or through the mechanical room.

Do not use wet cell batteries, particularly for exit lights and emergency lights.

Coordinate with mechanical and plumbing disciplines to ensure that proper NEC clearances are maintained around electrical equipment in electrical and mechanical rooms.

Install surface mounted panel boards in unfinished areas of buildings. Install flush or semiflush panel boards in other areas. Provide spare 1P circuit breakers and spaces for future expansion.

Coordinate plans so that lighting fixtures, smoke detectors, supply and return grilles, and other ceiling mounted equipment do not overlap or interfere with each other.

Do not install timers to control lighting in latrines and showers.

State in the contract that when systems or equipment require special tools or peripheral equipment to repair, operate, maintain, or program that tool or equipment shall be provided to the DPW. This includes laptop computers and/or software. This applies in particular to fire alarm equipment and fiber optic systems. Also state in the contract that the contractor shall provide and schedule appropriate training for DPW personnel to maintain unusual systems and equipment.

Provide reduced voltage starting where motor starting kVA will result in more than a 30% transient voltage dip per DA technical guidance (Technical Manual 5-811-2).

Use 3 phase motors to the maximum extent possible especially for integral (1/2, 3/4 HP) motors that start and stop frequently. (i.e. pumps and air compressors. General rule is less Section: Appendix DD Page 687 of 947

than 1 HP is single phase but single phase motors that start/stop frequently tend to wear out faster).

Provide single-phase protection on all 3-phase motors.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

- Rebuilt or reconditioned transformers will be not installed.
- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.
- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.
- The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:

Model Number:

Serial Number

Manufacture Date:

KVA and Phase:

Primary Voltage:

Secondary Voltage:

Installation Date:

State Installed:

Location Installed:

Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the DPW Environmental Division should be contacted. The POC for PCB is Russ Godsave at (270) 798-9637.

#### **Instructions to Designers:**

1. Include all features into project design and contract documents specifications as they apply.

#### **Return to Table of Contents**

## Section 26 27 13.10 30 Electric Meters

#### Ft. Campbell Requirements:

- 1.0 Electrical meters and instrument transformers shall meet or exceed the following minimum requirements:
- 1.1 Measure quantities. Electrical meter quantities measured are Power (kiloWatt), average demand over 15 minute intervals and Energy (kiloWatt-hours).
- 1.2 System Accuracy. System accuracy for the meter product devices including instrument transformers shall not exceed 1% as calculated using the Root Sum Square (RSS) method and assuming normal distribution.

#### 1.3 Meter Accuracy:

- 1.3.1 For facilities with connected loads equal to or greater than one (1) mega voltampere (MVA), meter certification shall be NEMA/ANSI C12.20, Accuracy class 0.2%.
- 1.3.2 For facilities with loads less than 1MVA, meter certification shall be IEEE/ANSI C12.16, Accuracy class 0.5%.
- 1.4 Communication Protocol. Meters shall communicate via either Modbus RTU or ANSI/CEA-709.1b (LonTalk) protocols or as otherwise specified. Protocol must be compatible with the EMCS system described in <u>Section 25 10 10</u> Lonworks Utility Monitoring and Control System.
- 1.5 Auxiliary data ports. Unless otherwise specified, electrical meters shall have a minimum of two pulse inputs for incorporation of other external meter data.
- 1.6 Surge Protection. IEEE/ANSI C37.90.1, Standard surge withstand capability (SWC) tests for relays and relay systems associated with electric power apparatus.
- 1.7 Current transformers (CTs) sized properly so that the meter secondary of the transformer shall output current to ensure at least a plus or minus 0.6% accuracy of current when measured between 10% and 90% of full amperage range.
  - 1.7.1 CTs shall not exceed 5 amps on the secondary side.
  - 1.7.2 Burden on CTs shall not exceed rated burden for the accuracy class.
  - 1.7.3 CTs shall be provided in solid or split core configurations.

Section: Appendix DD W912QR-23413770 CERTIFIED FINAL-003 Page 689 of 947

- 1.7.4 CTs shall be provided in the appropriate ranges to meet the service entrance amperage requirements.
- 1.7.5 For facilities with a connected load equal to or greater than 1MVA, CT certification shall be IEC 185 or ANSI/IEEE C57.13 for 0.3% accuracy class or better.
- 1.7.6 For facilities with a connected load less than 1MVA, CTs shall revenue grade and certified per IEEE/ANSI C57.13 or IEC 185.
- 1.8 Current sensors shall be sized properly for the application and provide a voltage (normally 0-2 volts) to the meter that results in at least a plus or minus 0.6% accuracy of current when measured between 10% and 90% of full amperage range.
- 1.9 Voltage or Potential Transformers (PTs) sized properly so that the meter secondary of the transformer shall output voltage to ensure at least a plus or minus 0.6% accuracy of voltage when measured from zero to the IEEE/ANSI C57.13 or IEC 185 specified standard burden, at the specified standard burden power factor, and at any value from 90% to 110% of rated voltage.
  - 1.9.1 For facilities with a connected load equal to or greater than 1MVA, PT certification shall be IEC 185 or IEEE/ANSI C57.13 for 0.3% accuracy class or better.
  - 1.9.2 For facilities with a connected load less than 1MVA, PTs shall be revenue grade and certified per IEEE/ANSI C57.13 or IEC 185.
    - 1.9.3 Burden on PTs shall not exceed rated burden for accuracy class.
- 1.10 Data Storage. Unless otherwise specified, the meter must be capable of providing and storing required interval data for a minimum of 30 days.
  - 1.11 Environmental Tolerances of Metering Devices.
  - 1.11.1 Outdoor/exterior devices shall be rated for operation and storage from -20° to 70° C or better and 5 to 100% relative humidity (non-condensing). Exterior meters shall be provided with or installed within a NEMA 4 enclosure. Enclosures shall be NEMA 4X for coastal and corrosive environments.
  - 1.11.2 Indoor/interior devices shall be rated for operation and storage from 0° 50° C or better and 5 to 90% relative humidity (non-condensing). Interior meters shall be provided with or installed within a NEMA 12 enclosure.
- 1.12 Reimbursable. Metering devices exceeding the above requirements that are requested by Reimbursable facilities/customers shall be installed per written request as provided in pre-proposal documentation.
- 2.0 Advanced Metering Data Management System front end computer requirements are:

2.1 Data encapsulation format shall be Extensible Markup Language (XML) and Simple Object Access Protocol (SOAP) for future output to a remote centralized meter data management system.

2.2 Storage of metered data for at least 2 years.

#### 2.3 Display:

Section: Appendix DD

- 2.3.1 Display of data upon request and selectable from 1 minute to 15 minutes for kW.
- 2.3.2 Final install of front end equipment shall, at minimum, display accurate data readings for each meter in a text format. Customization of the user interface is not required. Two hardcopies and two electric copies (DVD or CD) of detailed instructions shall be provided for customization and integration of additional display features that are not prepared at the time of final install.
- 2.3.3 Display capability shall include multiple graphical formats such as data vs. time (minutes, hours, days, weeks, months, and year) comparison between metered data from two or more meters and other standard meter data.
- 2.4 System expansion capability of 50 times for incremental future growth of metered data to include water, gas and steam.
- 2.5 Data Transmission Media is LAN for interface of metered data to the Advanced Metering Data Management System.

#### **Return to Table of Contents**

#### Section 26 32 14.00 10 Diesel-Generator Set, Stationary, 15-2500 KW Standby Applications

#### Ft. Campbell Requirements:

#### PART 1 GENERAL

#### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C12.11 (1987; R 1993) Instrument Transformers for Revenue Metering, 10 kV BIL through 350

kV BIL (0.6 kV NSV through 69 kV NSV)

ANSI C39.1 (1981; R 1992) Requirements for Electrical Analog Indicating Instruments

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 106 (1999el) Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A 135 (1997c) Electric-Resistance-Welded Steel Pipe

ASTM A 181/A 181M (2000) Carbon Steel Forgings for General-Purpose Piping

ASTM A 234M (2000) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

ASTM B 395 (1995) U-Bend Seamless Copper and Copper Alloy Heat Exchanger

ASTM B 395M (1995) U-Bend Seamless Copper and Copper Alloy Heat Exchanger and Condenser Tubes (Metric)

ASTM D 975 (1998b) Diesel Fuel Oils

ASME INTERNATIONAL (ASME)

ASME B16.3 (1998) Malleable Iron Threaded Fittings

ASME B16.5 (1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24

ASME B16.11 (1996) Forged Fittings, Socket-Welding and Threaded

ASME B31.1 (1998) Power Piping

ASME BPVC SEC VIII D1 (1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

ASME BPVC SEC IX (1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC CS5 (1994; CS5a-1995) Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 Through 46 kV

AEIC CS6 (1996) Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 Through 69 kV

ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)

EGSA 101P (1995a) Engine Driven Generator Sets

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code IEEE Std 1 (1986; R 1992) General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation

IEEE Std 48 (1998) Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV

IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

IEEE Std 100 (1997) IEEE Standard Dictionary of Electrical and Electronics Terms

IEEE Std 120 (1989) Electrical Measurements in Power Circuits

IEEE Std 404 (1993) Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V Through 138 000 V and Cable Joints for Use with Laminated Dielectric Cable Rated 2500 V Through 500 000 V

IEEE Std 519 (1992) Harmonic Control in Electrical Power Systems
MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches NEMA ICS 2 (1993) Industrial Controls and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC

NEMA ICS 6 (1993) Industrial Control and Systems, Enclosures

NEMA WC 7 (1988; Rev 3 1996) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NEMA WC 8 (1988; Rev 3 1996) Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

Page 693 of 947

NEMA MG 1 (1998) Motors and Generators

NEMA PB 1 (1995) Panel boards

Section: Appendix DD

NEMA SG 3 (1995) Power Switching Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30 (1996; Errata TIA 96-2) Flammable and Combustible Liquids Code

NFPA 37 (1998) Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 70 (1999) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE ARP 892 (1965; R 1994) D-C Starter-Generator, Engine

SAE J 537 (1996) Storage Batteries

UNDERWRITERS LABORATORIES (UL)

UL 489 (1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 891 (1994; Rev thru Jan 1995) Dead-Front Switchboards

UL 1236 (1994; Rev thru Mar 1999) Battery Chargers for Charging Engine-Starter Batteries

#### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Layout; G

Drawings; G

- a. Base-mounted equipment, complete with base and attachments including anchor bolt template and recommended clearances for maintenance and operation.
- b. Starting system.
- c. Fuel system.
- d. Cooling system.

e. Exhaust system.

Section: Appendix DD

- f. Electric wiring of relays, breakers, programmable controllers, and switches including single line and wiring diagrams.
- g. Lubrication system, including piping, pumps, strainers, filters, heat exchangers for lube oil and turbocharger cooling, electric heater, controls and wiring.
- h. Location, type, and description of vibration isolation devices.
- i. The safety system, including wiring schematics.
- j. One-line schematic and wiring diagrams of the generator, exciter, regulator, governor, and all instrumentation.
- k. Panel layouts.
- I. Mounting and support for each panel and major piece of electrical equipment.
- m. Engine-generator set rigging points and lifting instructions.

#### Acceptance; G

Drawings, which accurately depict the as-built configuration of the installation, upon acceptance of the diesel-generator, set installation. Layout drawings shall be revised to reflect the as-built conditions and submitted with the as-built drawings.

#### SD-03 Product Data

Performance Tests: G

Calculations of the engine and generator output power capability, including efficiency and parasitic load data.

#### Sound Limitations: G

Sound power level data for the packaged unit operating at 100% load in a free field environment. The data should demonstrate compliance with the sound limitation requirements of this specification.

#### Generator: G

Each generator KW rating and short circuit capacity (both symmetric and asymmetric).

#### Day Tank; G

Calculations for the capacity of each day tank, including allowances for recirculated fuel, usable tank capacity, and duration of fuel supply.

#### Power Factor: G

Generator capability curve showing generator kVA output (kW vs. kvar) for both leading and lagging power factors ranging from 0 to 1.0.

Heat Rejected to Engine-Generator Space; G

Page 695 of 947

Manufacturer's data to quantify heat rejected to the space with the engine generator set at rated capacity.

#### Time-Delay on Alarms; G

Section: Appendix DD

The magnitude of monitored values, which define alarm or action, set points, and the tolerance (plus and/or minus) at which the device activates the alarm or action.

#### Cooling System; G

- a. The maximum and minimum allowable inlet temperatures of the coolant fluid.
- b. The maximum allowable temperature rise in the coolant fluid.
- c. The minimum allowable inlet fuel temperature.

#### Manufacturer's Catalog; G

Manufacturer's standard catalog data describing and depicting each engine-generator set and all ancillary equipment in sufficient detail to demonstrate specification compliance.

#### Vibration Isolation; G

Vibration isolation system performance data for the range of frequencies generated by the engine-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Description of seismic zone C or equivalent qualification of the engine-generator mounting, base, and vibration isolation.

#### Instructions: G

Instructions including: the manufacturer's pre-start checklist and precautions; startup procedures for test mode, manual-start mode, and automatic-start mode, (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation, load-shedding, and automatic transfer switches). Instructions shall be weatherproof, laminated in plastic, framed, and posted where directed. Posted data shall include wiring and control diagrams showing the key mechanical and electrical control elements, and a diagrammatic layout of the system.

#### Experience: G

Statement and locations showing that each component manufacturer has a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel-engine generator sets for commercial and industrial use of similar generator set size, location and function as that identified in the construction documents.

#### Field Engineer:

A letter listing the qualifications, schools, formal training, and experience of the field engineer.

#### Site Welding;

A letter listing the welder qualifying procedures for each welder, complete with supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their qualifications symbols.

#### General Installation; G

Page 696 of 947

A complete copy of the manufacturer's installation procedures. A detailed description of the manufacturer's recommended break-in procedure.

#### Site Visit:

A site visit letter stating the date the site was visited and listing discrepancies found.

#### SD-06 Test Reports

Onsite Inspection and Tests; G,

Section: Appendix DD

- a. A letter giving notice of the proposed dates of all onsite inspections and tests at least 14 days prior to beginning tests.
- b. A detailed description of the Contractor's proposed procedures for onsite tests including the test including the test plan and a listing of equipment necessary to perform the tests. Submission shall be at least 7 days prior to beginning tests.
- c. Six copies of the onsite test data described below in 216 x 279 mm (8-1/2 x 11 inch) 3-ring binders with a separate section for each test. Sections shall be separated by dividers with tabs. Data plots shall be full size 216 x 279 mm (8-1/2 x 11 inches) minimum), showing all grid lines, with full resolution.
- (1) A description of the procedures for onsite tests.
- (2) A list of equipment used, with calibration certifications.
- (3) A copy of measurements taken, with required plots and graphs.
- (4) The date of testing.
- (5) The parameters verified.
- (6) The condition specified for the parameter.
- (7) The test results, signed and dated.
- (8) A description of all adjustments made.

#### SD-07 Certificates

Vibration Isolation; G

Torsional analysis including prototype testing or calculations, which certify and demonstrate that no damaging or dangerous torsional vibrations will occur when the prime mover is connected to the generator, at synchronous speeds, plus/minus 10%.

#### Prototype Tests:

Manufacturer's standard certification that prototype tests were performed for the generator model proposed.

Design Prototype Tests.

Page 697 of 947

 Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:

Maximum power (kW).

Section: Appendix DD

- Maximum motor starting (kVA) at 35% instantaneous voltage dip.
- Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
- Governor speed regulation under steady-state and transient conditions.
- Voltage regulation and generator transient response.
- Harmonic analysis, voltage waveform deviation, and telephone influence factor.
- Three-phase short circuit tests
- Alternator cooling air flow.
- Torsional analysis to verify that the generator set is free of harmful torsional stresses.
- Endurance testing.

#### **Final Production Tests**

- Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
- Single-step load pickup
- Transient and steady-state governing
- Safety shutdown device testing
- Voltage regulation
- Rated Power @ 0.8 PF
- Maximum power
- A witness test or a certified test record sent prior to shipment.

#### Reliability and Durability; G

Documentation, which cites engines and generators in similar service to demonstrate compliance with the requirements of this specification. Certification does not exclude annual technological improvements made by a manufacturer in the basic standard model set on which experience was obtained, provided parts interchangeability has not been substantially affected and the current standard model meets all the performance requirements of this specification. For each different set, 2 like sets shall have performed satisfactorily in a stationary power application, independent and separate from the physical location of the manufacturer's and assembler's facilities, for a minimum of 2 consecutive years without any failure to start, including periodic exercise. The certification shall state that for the set proposed to meet this specification, there were no failures resulting in downtime for repairs in excess of 72 hours or any failure due to overheating during 2 consecutive years of service. Like sets are of the same model, speed, bore, stroke, number and configuration of cylinders, an output powers rating. Like generators are of the same model, speed, pitch, cooling, exciter, voltage regulator and output power rating. A list shall be provided with the name of the installations, completion dates, and name and telephone number of a point of contact.

#### Emissions; G

A certification from the engine manufacturer stating that the engine exhaust emissions meet federal, state, and local regulations and restrictions specified. At a minimum, this certification shall include emission factors for criteria pollutants including nitrogen oxides, carbon monoxide, particulate matter, sulfur dioxide, non-methane hydrocarbon, and for hazardous air pollutants (HAPs).

#### Sound limitations: G

A certification from the manufacturer stating that the sound emissions meet the specification.

#### Flywheel Balance; G

Manufacturer's certification that the flywheel has been statically and dynamically balanced and is capable of being rotated at 125% of rated speed without vibration or damage.

#### Materials and Equipment; G

A letter stating that where materials or equipment are specified to comply with requirements of UL, or other standards, written proof of such compliance has been obtained. The label or listing of the specified agency, or a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency are acceptable as proof.

#### Factory Inspection and Tests; G

A certification that each engine generator set passed the factory tests and inspections and a list of the test and inspections.

#### Inspections: G

A letter certifying that all facilities are complete and functional, that each system is fully functional, and that each item of equipment is complete, free from damage, adjusted, and ready for beneficial use.

Cooling System; G

Section: Appendix DD Page 699 of 947

Certification that the engine-generator set and cooling system function properly in the ambient temperatures

#### 1.3 SYSTEM DESCRIPTION

Each engine-generator set shall be provided and installed complete and totally functional. with all necessary ancillary equipment to include air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. Each engine generator set shall satisfy the requirements specified in the Engine Generator Parameter Schedule.

1.3.1 Engine-Generator Parameter Schedule	1.3.1	Engine-	-Generator	Parameter	Schedule
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- The generator set shall be a Kohler model or an approved equal with a alternator. It shall provide kW/ kVA when operating at volts, 60 Hz. .8 power factor. The generator set shall be capable of a Standby 130°C rating while operating in an ambient condition of less than or equal to 77° F and a maximum elevation of 7546 feet above sea level.
- Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip i.e. engine, alternator, voltage regulator and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.
- Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

#### Engine

- The -cubic-inch displacement engine shall deliver a minimum of HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
- Electronic isochronous governor capable of 0.25% steady-state frequency regulation.
- 12-volt positive-engagement solenoid shift-starting motor.
- 70-ampere automatic battery charging alternator with a solid-state voltage regulation.

Section: Appendix DD W912QR-23413770 CERTIFIED FINAL-003 Page 700 of 947

• Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.

- Dry-type replaceable air cleaner elements for normal applications.
- Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel.
- The turbocharged engine shall be fueled by diesel.
- The engine shall have a minimum of cylinders and be liquid-cooled by Unit Mounted Radiator 122°F/50°C.
- The engine shall be EPA certified from the factory.

#### Alternator

- The alternator shall be salient-pole, brushless, 2/3-pitch, 12 lead, selfventilated with drip-proof construction and amortisseur rotor windings and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to Standby 130°C. The excitation system shall be of brushless construction controlled by a solid- state voltage regulator capable of maintaining voltage within ±2.0% at any constant load from 0% to 100% of rating. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.
- The alternator shall have a single maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
- The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

#### ENGINE GENERATOR PARAMETER SCHEDULE

Service Load [] [kVA] [kW]
Power Factor .08
Motor Starting kVA (maximum) [] kVA
Maximum Speed 1800 rpm
Engine-Generator Application stand-alone
Engine Cooling Type water/ethylene glycol
Heat Exchanger Type fin-tube
Governor Type Isochronous Frequency Bandwidth + 0.4% (steady state]
Voltage Regulation + 2% (max.) (No load to full load) Voltage Bandwidth + 0.5 (steady state)
Frequency 60 Hz
Voltage [] volts Phases [3 Phase, Wye] [3 Phase, Delta] [1 Phase]
Minimum Generator 12% percent Sub transient Reactance
Nonlinear Loads [] kVA
Max Step Load Increase 100% of Service
Load at 0.8 PF
Max Step Load Decrease 100 % of Service Load at (without shutdown) 0.8 PF
Max Time to Start to 10 seconds to Assume Load
Max Summer Outdoor Temp 49 degrees C (Ambient)
Min Winter Outdoor Temp -30 degrees C (Ambient)

#### 1.3.2 Output Capacity

Installation Elevation 150M above sea level

Each generator set shall provide power equal to the sum of service load plus the machine's efficiency loss and associated ancillary equipment loads. Rated output capacity shall also consider engine and/or generator over-sizing required to meet requirements in paragraph Engine-Generator Parameter Schedule.

Section: Appendix DD Page 702 of 947

#### 1.3.3 Power Rating

Standby ratings shall be in accordance with EGSA 101P.

#### 1.4 GENERAL REQUIREMENTS

#### 1.4.1 Engine-Generator Set

Each set shall consist of one engine, one generator, and one exciter, mounted, assembled, and aligned on one base; and all other necessary ancillary equipment, which may be mounted separately. Sets shall be assembled and attached to the base prior to shipping. Set components shall be environmentally suitable for the locations shown and shall be the manufacturer's standard product offered in catalogs for commercial or industrial use. A generator strip heater shall be provided for moisture control when the generator is not operating.

#### 1.4.2 Nameplates

Each major component of this specification shall have the manufacturer's name, type or style, model or serial number, and rating number on a plate secured to the equipment. As a minimum, nameplates shall be provided for: Engines; Relays; Generators; Day tanks; Transformers (CT & PT); Regulators; Pumps and pump motors; Governors; Generator Breaker; Economizers; Heat exchangers (other than base-mounted).

#### **Engines Relays**

Generators Day tanks

Transformers (CT & PT) Regulators

Pumps and pump motors Governors

Generator Breaker Economizers

Heat exchangers (other than base-mounted)

Where the following equipment is provided as a standard component by the diesel-engine generator set manufacturer, the nameplate information may be provided in the maintenance manual in lieu of nameplates.

Battery charger Heaters

**Exhaust mufflers Exciters** 

Switchgear Silencers

Battery

#### 1.4.3 Personnel Safety Device

Exposed moving parts, parts that produce high operating temperatures, parts which may be electrically energized, and parts that may be a hazard to operating personnel during normal operation shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed so that proper operation of the equipment is not impaired.

#### 1.4.4 Verification of Dimensions

Before performing work, the premises shall be visited and details of the work verified. The Contracting Officer shall be advised in writing of any discrepancies before performing any work.

#### 1.4.5 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, the design, fabrication and installation shall conform to the code.

#### 1.4.6 Site Welding

Structural members shall be welded in accordance with Section 05090 WELDING, STRUCTURAL. For all other welding, procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by a previously qualified employer may be accepted as permitted by ASME B31.1. Welder qualification tests shall be performed for each welder whose qualifications are not in compliance with the referenced standards. The Contracting Officer shall be notified 24 hours in advance of qualification tests. The qualification tests shall be performed at the work site if practical. The welder or welding operator shall apply the assigned personal symbol near each weld made as a permanent record

### 1.4.7 Engine Generator Set Enclosure Weather Enclosure

- All enclosures are to be constructed from high strength, low alloy steel, aluminum or galvanized steel.
- The enclosure shall be finish coated with powder baked paint for superior finish, durability, and appearance. Enclosures will be finished in the manufacturer's standard color.
- The enclosures must allow the generator set to operate at full load in an ambient temperature of 40 - 45°C with no additional derating of the electrical output.
- Enclosures must be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker must meet the requirements of the National Electric Code.
- Doors must be hinged with stainless steel hinges and hardware and be removable.
- Doors must be equipped with lockable latches. Locks must be keyed alike.
- The enclosure roof must be pitched to prevent accumulation of water
- A duct between the radiator and air outlet must be provided to prevent re-circulation of hot air.
- The complete exhaust system shall be internal to the enclosure or optional with external mounted silencer
- The critical silencer shall be insulated with a tailpipe and rain cap

#### SOUND LIMITATIONS.

#### 1.4.8 Vibration Isolation

The maximum engine-generator set vibration in the horizontal, vertical and axial directions shall be limited to 0.15 mm (6 mils) peak-peak RMS with an overall velocity limit of 24 mm/seconds 0.95 inches/seconds RMS, for all speeds through 110% of rated speed. The engine-generator set shall be provided with vibration-isolation in accordance with the manufacturer's standard recommendation. Where the vibration-isolation system does not secure the base to the structure floor or unit foundation, seismic restraints shall be provided in accordance with the seismic parameters specified.

#### 1.4.9 Experience

Each component manufacturer shall have a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel engine-generator sets for commercial and industrial use. The engine-generator set manufacture/assembler shall have a minimum of 3 years experience in the manufacture, assembly and sale of stationary diesel engine-generator sets for commercial and industrial use.

#### 1.4.10 Field Engineer

The engine-generator set manufacturer or assembler shall furnish a qualified field engineer to supervise the complete installation of the engine-generator set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment. The field engineer shall have attended the engine-generator manufacturer's training courses on installation and operation and maintenance for engine generator sets.

#### 1.4.11 Seismic Requirements

Seismic requirements shall be in accordance with Sections 13080 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT, 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT and 16070 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT [as shown on the drawings]. All emergency/standby generators shall be mounted on spring isolators rated for seismic zone "C".

#### 1.5 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment in procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

#### 1.6 OPERATION AND MAINTENANCE MANUALS

The operation and maintenance manuals shall be submitted and approved prior to commencing onsite tests.

#### 1.6.1 Operation Manual

Three copies of the manufacturer's standard maintenance manual. (All available manuals) a. Procedures for each routine maintenance item. Procedures for troubleshooting. Factory-service, takedown overhaul, and repair service manuals, with parts lists.

- b. The manufacturer's recommended maintenance schedule.
- c. A component list, which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components, listed in paragraph GENERAL REQUIREMENTS.
- d. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.
- e. One hard copy of each manual and 2 complete copies of CD's shall be permitted instead of 3 hard copies.

#### 1.6.1 Deleted

#### 1.6.2 Maintenance Manual

Section: Appendix DD

Three copies of the [manufacturers standard maintenance manual] [maintenance manual containing the information described below in 216 x 279 mm (8-1/2 x 11 inch) three-ring binders shall be provided. Each section shall be separated by a heavy plastic divider with tabs. Drawings shall be folded, with the title block visible, and placed in plastic pockets with reinforced holes].

- a. Procedures for each routine maintenance item. Procedures for troubleshooting. Factory-service, overhaul, and repair service manuals, with parts lists.
- b. The manufacturer's recommended maintenance schedule.
- c. A component list, which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components, listed in paragraph GENERAL REQUIREMENTS.
- d. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.

#### 1.7 SPECIAL TOOLS AND FILTERS

Two sets of special tools and two sets of filters required for maintenance shall be provided. Special tools are those that only the manufacturer provides, for special purposes, or to reach otherwise inaccessible parts this also includes, software, firmware, hardware, cables and connectors and an electronic device capable of programming, diagnostic trouble shooting, memory of not less than 80gb if required for re-programming of any component. One handset shall be provided for each electronic governor when required to indicate and/or change governor response settings. Two complete sets of filters shall be supplied in a suitable storage box. These filters shall be in addition to filters replaced after testing.

#### PART 2 PRODUCTS

#### 2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified.

- 2.1.1 Circuit Breakers, Low Voltage NEMA AB 1, UL 489, and NEMA SG 3.
- 2.1.2 Filter Elements (Fuel-oil, Lubricating-oil, and Combustion-air) Manufacturer's standard.
- 2.1.3 Instrument Transformers ANSI C12.11.

- 2.1.4 Pipe (Sleeves, Fuel/Lube-oil, Compressed-Air, Coolant and Exhaust) ASTM A 53/A 53M, ASTM A 106 or ASTM A 135, steel pipe. Pipe smaller than 50 mm (2 inches) shall be Schedule 80. Pipe 50 mm (2 inches) and larger shall be Schedule 40.
- 2.1.5 Pipe Flanges and Fittings
- a. Pipe Flanges and Flanged Fittings: ASTM A 181/A 181M, Class 60, or ASME B16.5, Grade 1, Class 150.
- b. Pipe Welding Fittings: ASTM A 234/A 234M, Grade WPB or WPC, Class 150, or ASME B16.11, 1360.7 kg. (3000 lb.)
- c. Threaded Fittings: ASME B16.3, Class 150.
- d. Valves: MSS SP-80, Class 150.
- e. Gaskets: Manufacturers Standard.
- 2.1.6 Pipe Hangers MSS SP-58 and MSS SP-69.
- 2.1.7 Electrical Enclosures
- 2.1.7.1 General NEMA ICS 6.
- 2.1.7.2 Panel-boards NEMA PB 1.

#### 2.1.8 Electric Motors

Electric motors shall conform to the requirements of NEMA MG 1. Motors shall have sealed ball bearings, a maximum speed of 1800 rpm and integral automatic or manual reset thermal overload protectors. Motors used indoors shall have drip proof frames; those used outside shall be totally enclosed. AC motors larger than 373 W (1/2 Hp) (1/2 Hp) shall be of the squirrel cage induction type for standard voltage of 460 volts, 60 Hz three phase power. AC motors 373 W (1/2 Hp) (1/2 Hp) or smaller, shall be for standard voltage 115 volts, 60 Hz single-phase power.

2.1.9 Motor Controllers Motor controllers and starters shall conform to the requirements of NFPA 70 and NEMA ICS 2.

#### 2.2 ENGINE

Each engine shall operate on No. 2-D diesel conforming to ASTM D 975, shall be designed for stationary applications and shall be complete with ancillaries. The engine shall be a standard production model described in the manufacturer's catalog. The engine shall, supercharged or turbocharged. The engine shall be four-stroke-cycle and compression-ignition type. The engine shall be vertical inline, V-, or opposed-piston type, with a solid cast block or individually cast cylinders. The engine shall have a minimum of two cylinders. Opposed-piston type engines shall have no less than four cylinders. Each block shall have a coolant drain port. Each engine shall be equipped with an over-speed sensor.

#### 2.3 FUEL SYSTEM

The fuel system for each engine generator set shall conform to the requirements of NFPA 30 and NFPA 37 and contain the following elements.

#### 2.3.1 Pumps

#### 2.3.1.1 Main Pump

Each engine shall be provided with an engine driven pump. The pump shall supply fuel at a minimum rate sufficient to provide the amount of fuel required to meet the performance indicated within the parameter schedule. The fuel flow rate shall be based on meeting the load requirements and all necessary re-circulation.

#### 2.3.1.2 Auxiliary Fuel Pump

Auxiliary fuel pumps shall be provided to maintain the required engine fuel pressure, either required by the installation or indicated on the drawings. The auxiliary pump shall be driven by a dc electric motor powered by the starting/station batteries. The auxiliary pump shall be automatically actuated by a pressure-detecting device.

#### 2.3.2 Filter

A minimum of one full flow fuel filter shall be provided for each engine. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

#### 2.3.3 Relief/Bypass Valve

A relief/bypass valve shall be provided to regulate pressure in the fuel supply line, return excess fuel to a return line, and prevent the build-up of excessive pressure in the fuel system.

#### 2.3.4 Day Tank

Each engine shall be provided with a separate self-supporting day tank if required. Each day tank shall be provided with connections for fuel supply line, fuel return line, fuel overflow line, local fuel fill port, gauge, vent line, drain line, and float switch assembly for control. A fuel return line cooler shall be provided as recommended by the manufacturer and assembler. The temperature of the fuel returning to the day tank shall be below the flash point of the fuel. A temperature-sensing device shall be installed in the fuel supply line.

#### 2.3.4.1 Capacity

Section: Appendix DD Page 708 of 947

Each tank shall have capacity to supply fuel to the engine for an uninterrupted 2-hour period at 100% rated load without being refilled or 25 gallons, whichever is recommended or specified.

#### 2.3.4.2 Local Fuel Fill

Each local fuel fill port on the day tank shall be provided with a screw-on cap.

#### 2.3.4.3 Fuel Level Controls

- a. Each tank shall have a float-switch assembly to perform the following functions:
- (1) Activate the "Low Fuel Level" alarm at 70% of the rated tank capacity.
- (2) Activate the "Overfill Fuel Level" alarm at 95% of the rated tank capacity.

#### 2.3.4.4 Arrangement

Gravity flow tanks and any tank that allows a fuel level above the fuel injectors shall be provided with an internal or external factory installed valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating.

#### 2.3.5.1 Capacity, Standby

Each day tank shall have capacity to supply fuel to the engine for an uninterrupted 2-hour period at 100% rated load without being refilled, plus any fuel, which may be returned to the main fuel storage tank. The calculation of the capacity of each day tank shall incorporate the requirement to stop the supply of fuel into the day tank at 90% of the ultimate volume of the tank.

#### 2.3.5.2 Drain Line

Each day tank drain line shall be accessible and equipped with a shutoff valve. Selfsupporting day tanks shall be arranged to allow drainage into a 305 mm (12 inch) tall bucket.

#### 2.3.5.3 Local Fuel Fill

Each local fuel fill port on the day tank shall be provided with a screw-on cap.

#### 2.3.5.4 Fuel Level Controls

- a. Each day tank shall have a float-switch-assembly to perform the following functions:
- (1) Activate the "Overfill Fuel Level" alarm at 95% of the rated tank volume.
- (2) Activate the "Low Fuel Level" alarm at 70% of the rated tank Capacity.

#### 2.3.5.5 Arrangement

Day tanks may allow gravity flow into the engine. Gravity flow tanks shall be provided with an internal or external valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating. Day tanks shall be provided with any necessary pumps to supply fuel to the engine as recommended by the generator set manufacturer. The fuel supply line from the day tank to the manufacturer's standard engine connection shall be threaded pipe.

#### 2.3.6 Fuel Supply System

The fuel supply from the main storage of fuel to the day tank shall be as specified in Section 13202 FUEL STORAGE SYSTEMS.

#### Double Wall Secondary Containment Sub Base Fuel Tank

Section: Appendix DD

- A sub base fuel tank used in conjunction with a diesel powered generator set of
   \_\_\_kW will contain \_\_\_ gallons of fuel to support the generator set for a period of 48
   hours at 100% of rated load and 72 hours at 75% of rated load.
- The sub base fuel system is listed under UL 142, subsection entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.
- The above ground steel secondary containment rectangular tank for use as a sub base for diesel generators is manufactured and intended to be installed in accordance with the Flammable and Combustible Liquids Code—NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines—NFPA 37, and Emergency and Standby Power Systems—NFPA 110.
- Primary Tank. It will be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld. <u>The</u> Primary Tank shall not exceed 18 inches in height.
- Steel Channel Support System. Reinforced steel box channel for generator support, with a load rating of 5,000 lbs. per generator mounting hole location. Full height gussets at either end of channel and at generator mounting holes shall be utilized.
- Exterior Finish. The exterior coating has been tested to withstand continuous salt spray testing at 100 percent exposure for 244 hours to a 5 percent salt solution at 92-97° F. The coating has been subjected to full exposure humidity testing to 100 percent humidity at 100° F for 24 hours. Tests are to be conducted in accordance with The American Standard Testing Methods Society.
- Venting. Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4" (3 cm.) nominal inside diameter.
- Emergency Venting. The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. The vent is spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. The emergency relief vent is sized to accommodate the total venting capacity of both normal and emergency vents.
- Fuel Fill. There shall be a 2" NPT opening within the primary tank and lockable manual fill cap.

Section: Appendix DD Page 710 of 947

Fuel Level. A direct reading, UL listed, magnetic fuel level gauge with a hermetically sealed vacuum tested dial shall be provided to eliminate fogging

Low Fuel Level Switch. Consists of a 30 watt float switch for remote or local annunciation of a (50% standard) low fuel level condition.

#### 2.4 LUBRICATION

Each engine shall have a separate lube-oil system conforming to NFPA 30 and NFPA 37. Each system shall be pressurized by engine-driven oil pumps. Each system shall be furnished with a relief valve for oil pressure regulation (for closed systems) and a dipstick for oil level indications. The crankcase shall be vented in accordance with the manufacturer's recommendation except that it shall not be vented to the engine exhaust system. Crankcase breathers, if provided on engines installed in buildings or enclosures, shall be piped to vent to the outside. The system shall be readily accessible for service such as draining, refilling, etc. Each system shall permit addition of oil and have oil-level indication with the set operating. The system shall utilize an oil cooler as recommended by the engine manufacturer.

#### 2.4.1 Filter

One full-flow filter shall be provided for each pump. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

#### 2.4.2 Lube-Oil Sensors

Each engine shall be equipped with lube-oil pressure sensors. Pressure sensors shall be located downstream of the filters and provide signals for required indication and alarms.

#### 2.5 COOLING SYSTEM

Each engine cooling system shall operate automatically while the engine is running. Each cooling system shall be sized for the maximum summer outdoor design temperature and site elevation. Water-cooled system coolant shall use a combination of water and ethylene-glycol sufficient for freeze protection at the minimum winter outdoor temperature specified. The maximum temperature rise of the coolant across the engine shall be no more than that recommended and submitted in accordance with paragraph SUBMITTALS.

#### 2.5.1 Coolant Pumps

Coolant pumps shall be the centrifugal type. Each engine shall have an engine-driven primary pump. Secondary pumps shall be electric motor driven and have automatic controllers.

#### 2.5.2 Deleted

#### 2.5.2.1 Fin-Tube-Type Heat Exchanger (Radiator)

Heat exchanger may be factory coated with corrosive resistant film providing that corrosion measures are taken to restore the heat rejection capability of the radiator to the initial design requirement via over-sizing, or other compensating methods. Internal surfaces shall be compatible with liquid fluid coolant used. Materials and coolant are subject to approval by the Contracting Officer. Heat exchangers shall be pressure type incorporating a pressure valve,

vacuum valve and a cap. Caps shall be designed for pressure relief prior to removal. Each heat exchanger and the entire cooling system shall be capable of withstanding a minimum pressure of 48-kPa gauge (7 psi). (7 psi.) Each heat exchanger shall be protected with a strong grille or screen guard. Each heat exchanger shall have at least two tapped holes. One tapped hole in the heat exchanger shall be equipped with a drain cock, the rest shall be

#### 2.5.3 Expansion Tank

plugged.

Section: Appendix DD

The cooling system shall include an air expansion tank, which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting the pressure increase at all components in the system to the maximum allowable pressure at those components. The tank shall be suitable for an operating temperature of 121 degrees C (250 degrees F) and a working pressure of 0.86 MPa (125 psi). (125 psi.) The tank shall be constructed of welded steel, tested and stamped in accordance with ASME BPVC SEC VIII D1 for the stated working pressure. A bladder type tank shall not be used. Steel legs or bases for vertical installation shall support the tank.

#### 2.5.5 Temperature Sensors

Each engine shall be equipped with coolant temperature sensors. Temperature sensors shall provide signals for pre-high and high indication and alarms.

2.6 SOUND LIMITATIONS The noise generated by the diesel generator set operating at 100 percent load shall not exceed the following sound pressure levels in any of the indicated frequencies when measured in a free field at a radial distance of 7 meters (22.9 feet) at 45 degrees apart in all directions.

Frequency Band Maximum Acceptable

(Hz) Pressure Level

(Decibels)

31 [\_81\_\_\_]

63 [\_77\_\_\_\_

125 [\_71\_\_

250 [\_64\_\_\_

500 [\_58\_\_\_ 1,000 [\_55

2,000 [\_54\_\_

4,000 [ 54

8,000 [ 56

#### 2.7 AIR INTAKE EQUIPMENT

Filters and silencers shall be provided in locations that are convenient for servicing. The silencer shall be of the high-frequency filter type, located in the air intake system as recommended by the engine manufacturer. Silencer shall be capable of reducing the noise level at the air intake to a point below the maximum acceptable levels specified in paragraph SOUND LIMITATIONS. A combined filter-silencer unit meeting requirements for the separate filter and silencer items may be provided. Expansion elements in air-intake lines shall be rubber.

#### 2.8 EXHAUST SYSTEM

The system shall be separate and complete for each engine. Piping shall be supported so as to minimize vibration. Where a V-type engine is provided, a V-type connector with necessary flexible sections and hardware shall connect the engine exhaust outlets.

#### 2.8.1 Flexible Sections and Expansion Joints

A flexible section at each engine and an expansion joint at each muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for dieselengine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

#### 2.8.2 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for [outside] [inside] [vertical] [horizontal] mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature 204 degrees C (400 degrees F) resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations in paragraph SOUND LIMITATIONS. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

#### 2.8.3 Exhaust Piping

Exhaust muffler shall be provided for each engine, size and type as recommended by the generator set manufacturer. A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for outside horizontal mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature, 2040 C resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

A flexible section at each engine and an expansion joint at each muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type.

Expansion and flexible elements shall be stainless steel suitable for diesel engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration form the engine and compensation for thermal expansion and contraction.

Exhaust Piping: Horizontal sections of exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be long-radius. Exhaust piping shall be provide with a hinged gravity operated, self-closing rain cover.

#### 2.9 EMISSIONS

The finished installation shall comply with Federal, state, and local regulations and restrictions regarding the limits of emissions.

#### 2.10 STARTING SYSTEM

The starting system for standby engine generator sets used in emergency applications shall be in accordance with NFPA 99 and NFPA 110 and as follows

#### 2.10.1 Controls

#### Generator Set Controller:

- The generator set controller shall be a microprocessor based control system that will
  provide automatic starting, system monitoring and protection. The controller system
  shall also provide local monitoring and remote monitoring. The control system shall be
  capable of PC based updating of all necessary parameters, firmware and software.
- The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.

#### Controller Buttons, Display and Components

- The generator set controller shall include the following features and functions:
- Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:

Run Mode: When in the run mode the generator set shall start

as directed by the operator.

Off/Reset When in the Off/Reset mode the generator set shall Mode: stop, the reset shall reset all faults, allowing for the

restarting of the generator set after a shutdown.

Auto Mode: When in Auto the mode the generator set shall be

te device.

• Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:

Run Mode: When in the run mode the generator set shall start

as directed by the operator.

Off/Reset When in the Off/Reset mode the generator set shall Mode: stop, the reset shall reset all faults, allowing for the

restarting of the generator set after a shutdown.

Auto Mode: When in Auto the mode the generator set shall be

ready to accept a signal from a remote device.

Section: Appendix DD W912QR-23413770 CERTIFIED FINAL-003
Page 714 of 947

 Emergency Stop Switch. The remote stop switch shall be red in color with a "mushroom" type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.

- Push Button/Rotary Selector dial. This dial shall be used for selection of all Menus and sub-menus. Rotating the dial moves you through the menus, pushing the dial selects the menu and function/features in that menu. Pushing the button selects the feature/function and sub-menus.
- Digital Display. The digital display shall be alphanumeric, with 2 lines of data and approximately 24 charters. The display shall have back lighting for ease of operator use in high and low light conditions. The display shall display status of all faults and warnings. The display shall also display any engine faults. While the generator set is running the display shall scroll all important information across the screen for ease of operator use. The scroll can be stopped by pushing the rotary dial. The display shall fall asleep when the generator set is not running and will wake-up when the generator set starts or the rotary dial is depressed.
- Fault Light. The controller shall have an annunciator fault light that glows red
  for faults and yellow for warnings. These faults and warnings shall be
  displayed in the digital display. The fault light will also glow yellow when not
  in AUTO.
- Alarm Horn. The controller shall provide an alarm horn that sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the AUTO mode.
- Alarm Silence/Lamp Test Button. When this button is depressed it shall test all controller lamps. This button will also silence the alarm horn when the unit is not AUTO.
- USB Connection. The controller shall have a USB connection on the face of the controller. This connection shall allow for updating of all software and firmware. This port shall also allow for all servicing of generator set parameters, fault diagnostics and viewing of all controller information via use a laptop computer.
- Dedicated user inputs. The controller shall have dedicated inputs for remote emergency stop switch, remote 2 wire star for transfer switch and auxiliary shutdown.
- The controller shall have auto resettable circuit protection integral on the circuit board.

System Controller Monitoring and Status Features and Functions

 The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller

Overview menu

Section: Appendix DD

- 1. Active shutdowns and warnings shall be displayed if present and without the need of operator interface.
- 2. Engine runtime with total hours
- 3. Average line to line voltage
- 4. Coolant temperature
- 5. Fuel level or pressure
- 6. Oil pressure
- 7. Battery voltage
- 8. Software version
- 9. Frequency
- 10 Average current

.

- Engine metering menu
  - 1. Engine speed
  - 2. Oil pressure
  - 3. Coolant temperature
  - 4. Battery voltage
- Generator metering menu
  - 1. Total power in VA
  - 2. Total power in W
  - 3. Rated power % used
  - 4. Voltage L-L and L-N for all phases
  - 5. Current L1, L2, L3
  - 6. Frequency
- Generator set information
  - Generator set model number
  - 2. Generator set serial number
  - 3. Controller set number
- Generator set run time
  - 1. Engine run time total hours
  - 2. Engine loaded total

hours

- 3. Number of engine starts
- 4. Total energy in kW
- Generator set system
  - 1. System voltage
  - 2. System frequency 50/60Hz
  - 3. System phase, single/three phase
  - 4. Power rating kW
  - 5. Amperage rating
  - 6. Power type standby/prime
  - 7. Measurement units, metric/English units adjustable
  - 8. Alarm silence, always or auto only
- Generator set Calibration; the following are adjustable at the controller
  - Voltage L-L and L-N all phases
  - 2. Current L1, L2, L3
  - 3. Reset all calibrations
- Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller
  - 1. Voltage Adjustable +/10%
- Digital and Analog Inputs and outputs
  - Displays settings and status
- Event Log
  - Stores event history, up to 1000 events

#### Controller Engine control features and functions

- Automatic restart the controller has automatic restart feature which initiates the start routine and re-crank after a failed start attempt.
- Cyclic cranking the controller shall have programmable cyclic cranking
- Engine starting aid the controller shall have the capability of providing control for an optional engine starting aid.

Section: Appendix DD Page 717 of 947

• The control system shall include time delays for engine start and cool down.

- The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and actual failure conditions.
- The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring.

#### Controller Alternator control features and functions

- Integrated hybrid voltage regulator. The system shall have integral microprocessor based voltage regulator system that provides +/- 5% voltage regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.
- AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
- Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
- Power metering. The controller digitally displays power metering of kW and kVA.

#### Other control features and functions

- Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
- Historical data logging. The controllers' total number of generator set successful start shall be recorded and displayed.
- Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be

capable to being stored on a laptop for future upgrades of printing for analysis.

#### Generator Set Warning, Shutdown Alarm and Status

 The generator set shall have alarms and status indication lamps that show nonautomatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns must exist as a minimum:

#### Engine functions

Section: Appendix DD

- 1. Critical high fuel level (alarm)
- 2. ECM communication loss (shutdown)
- 3. ECM diagnostics (alarm & shutdown)
- 4. Engine over speed (shutdown)
- 5. Engine start aid active
- 6. Engine under speed (shutdown)
- 7. Fuel tank leak (alarm & shutdown)
- 8. High DC battery voltage (alarm)
- 9. High coolant temperature (alarm & shutdown)
- 10. High fuel level (alarm)
- 11. Low DC battery voltage (alarm)
- 12. Low coolant level (shutdown)
- 13. Low coolant temperature (alarm)
- 14. Low cranking voltage (alarm)
- 15. Low engine oil level (alarm & shutdown)
- 16. Low fuel level (alarm & shutdown)
- 17. Low fuel pressure (alarm)
- 18. Low oil pressure (alarm & shutdown)
- 19. No coolant temperature signal (shutdown)
- 20. No oil pressure signal (shutdown)
- 21. Over crank (shutdown)
- 22. Speed sensor fault (alarm)

#### Generator functions

- AC sensing loss over & under current (alarm & shutdown)
- 2. Alternator protection (shutdown)
- 3. Ground fault input (alarm)
- 4. kW overload (shutdown)
- 5. Locked rotor (shutdown)
- 6. Over-frequency (shutdown)
- 7. Over AC voltage (shutdown)
- 8. Under-frequency (shutdown)
- 9. Under AC voltage (shutdown)
- 10. Emergency stop (shutdown)

- Other General functions
  - 1. Battery charger fault (alarm)
  - 2. Common fault (shutdown)
  - 3. Common warning (alarm)
  - 4. Master switch not in auto (alarm)
  - 5. Generator running
  - 6. Input/output fault (alarm)
- The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements which include several of the above along with; EPS supplying load, Master switch not in auto and contacts for local and remote common alarm.

#### 2.10.2 Capacity

The starting system shall be of sufficient capacity, at the maximum outdoor summer temperature specified to crank the engine without damage or overheating. The system shall be capable of providing a minimum of three cranking periods with 15-second intervals between cranks. Each cranking period shall have a maximum duration of 15 seconds.

#### 2.10.3 Functional Requirements

Starting system shall be manufacturers recommended dc system utilizing a negative circuit ground. Starting motors shall be in accordance with SAE ARP 892. 2.10.4 Battery

A starting battery system shall be provided and shall include the battery, battery rack, intercell connectors, and spacers. The battery shall be in accordance with SAE J 537. Critical system components (rack, protection, etc.) shall be sized to withstand the seismic acceleration forces specified. The battery shall be lead-acid non-maintenance type, with sufficient capacity, at the minimum outdoor winter temperature specified to provide the specified cranking periods. Valve-regulated lead-acid batteries are not acceptable.

#### 2.10.5 Battery Charger

A 10-amp voltage regulated battery charger shall be provided for each engine generator set. Charger may be mounted in an automatic transfer switch if desired. Chargers shall not be mounted on the generator set. Charger shall be equipped with float, taper and equalize charge settings. Operations monitors shall provide visual output along with individual from C contacts rated at 4-amps, 120 VAC, 30 VDC from remote indication of:

Loss of AC power - RED Light

Low battery voltage - RED Light

High battery voltage - RED Light

Power ON - GREEN Light (no relay contact)

#### 2.10.6 Starting Aids

The manufacturer shall provide one or more of the following methods to assist engine starting.

#### 2.10.6.1 Deleted

#### 2.10.6.2 Jacket-Coolant Heaters

A thermostatically controlled electric heater shall be mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 3 degrees of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized. The control temperature shall be the temperature recommended by the engine manufacturer to meet the starting time specified.

#### 2.11 GOVERNOR

Each engine shall be provided with a governor, which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100% of rated output capacity. The governor shall be configured for safe manual adjustment of the speed/frequency during operation of the engine generator set, without special tools, from 90 to 110 % of the rated speed/frequency, over a steady state load range of zero to 100% of rated capacity. Isochronous governors shall maintain the midpoint of the frequency bandwidth at the same value for steady-state loads over the range of zero to 100% of rated output capacity

#### 2.12 GENERATOR

Each generator shall be of the synchronous type, one or two bearing, conforming to NEMA MG 1, equipped with winding terminal housings in accordance with NEMA MG 1, equipped with an amortisseur winding, and directly connected to the engine. Insulation shall be Class H standby rating at a minimum of 130 o C temperature rise. Generator design shall protect against mechanical, electrical and thermal damage due to vibration, 25 percent over-speeds, or voltages and temperatures at a rated output capacity of 100 percent. Generator ancillary equipment shall meet the short circuit requirements of NEMA MG 1. Frames shall be the drip-proof type.

#### 2.12.1 Current Balance

At 100 percent rated load, and load impedance equal for each of the three phases, the permissible current difference between any two phases shall not exceed 2 percent of the largest current on either of the two phases.

#### 2.12.2 Voltage Balance

At any balanced load between 75 and 100 percent of rated load, the difference in line-to-neutral voltage among the three phases shall not exceed 1 percent of the average line-to-neutral voltage. For a single-phase load condition, consisting of 25 percent load at unity power factor placed between any phase and neutral with no load on the other two phases, the maximum simultaneous difference in line-to-neutral voltage between the phases shall not exceed 3 percent of rated line to neutral voltage. The single-phase load requirement shall be valid utilizing normal exciter and regulator control. The interpretation of the 25 percent load

for single-phase load conditions means 25 percent of rated current at rated phase voltage and unity power factor.

#### 2.12.3 Waveform

The deviation factor of the line-to-line voltage at zero load and at balanced full rated load at 0.8 power factor shall not exceed 10%. The RMS of all harmonics shall be less than 5.0% and that of any one harmonic less than 3.0% at full rated load. Each engine-generator shall be designed and configured to meet the total harmonic distortion limits of IEEE Std 519.

#### 2.13 EXCITER

The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300% for peak inverse voltage and forward current ratings for all operating conditions, including 110% generator output at 40 degrees C (104 degrees F) ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified.

#### 2.14 VOLTAGE REGULATOR

Each generator shall be provided with a solid-state voltage regulator, separate from the exciter. The regulator shall maintain the voltage within a bandwidth of the rated voltage, over a steady-state load range of zero to 100% of rated output capacity. Regulator shall be configured for safe manual adjustment of the engine generator voltage output without special tools, during operation from 90 to 110% of the rated voltage over the steady state load range of zero to 100% of rated output capacity. Regulation drift shall not exceed plus or minus 0.5% for an ambient temperature change of 20 degrees C. (36 degrees F.)

#### 2.14.1 Steady State Performance (Regulation or Voltage Droop).

The voltage regulator shall have a maximum droop of 2% of rated voltage over a load range from 0 to 100% of rated output capacity and automatically maintain the generator output voltage within the specified operational bandwidth.

#### 2.15 GENERATOR PROTECTION

Short circuit and overload protection for the generator shall be provided. The generator circui
breaker (IEEE Device 52) ratings shall be consistent with the generator rated voltage and
frequency, with continuous, short circuit and interrupting current ratings to match the
generator capacity. The manufacturer shall determine the short circuit current interrupting
rating of the breaker. The breaker shall be engine generator base mounted by the engine-
generator set manufacturer. UL listed molded case thermal magnetic type rated at []
amps, [] pole, and [] volts. Each breaker shall be provided with shunt trip and wired
to the engine fault conditions. Field circuit breakers shall not be acceptable for generator
over-current protection. Surge protection shall be provided for each phase of the generator,
to be mounted at the generator terminals.

#### 2.15.1 Panel-boards

Panel-boards shall be metal-enclosed, general purpose, [3-phase, 4-wire], [1-phase, 3-wire], [600][\_\_\_\_] volt rated, with neutral bus and continuous ground bus, conforming to NEMA PB 1 and UL 891. Neutral bus and ground bus capacity shall be [as shown][full capacity]. Enclosure designs, construction, materials and coatings shall be [as indicated][suitable for the application and environment]. Bus continuous current rating shall be [at least equal to the

generator rating and correspond to UL listed current ratings specified for panel boards and switchboards][as indicated]. Current withstand rating (short circuit rating) shall match the generator capacity. Buses shall be copper.

#### 2.15.2 Devices

Switches, circuit breakers, switchgear, fuses, relays, and other protective devices shall be as specified in Section 16475 COORDINATED POWER SYSTEM PROTECTION.

#### 2.16 SAFETY SYSTEM

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions. The safety system shall be provided with a self-test method to verify its operability. Alarm signals shall have manual acknowledgement and reset devices. The alarm signal systems shall reactivate for new signals after acknowledgment is given to any signal. The systems shall be configured so that loss of any monitoring device shall be dealt with as an alarm on that system element.

#### 2.16.1 Audible Signal

The audible alarm signal shall sound at a frequency of 70 Hz at a volume of 75 dB at 3.1 m (10 feet). The sound shall be continuously activated upon alarm and silenced upon acknowledgment. Signal devices shall be located as shown.

#### 2.16.2 Visual Signal - Signal

The visual alarm signal shall be a panel light. The light shall be normally off, activated to be blinking upon alarm. The light shall change to continuously light upon acknowledgement. If automatic shutdown occurs, the display shall maintain activated status to indicate the cause of failure and shall not be reset until cause of alarm has been cleared and/or restored to normal condition. Shutdown alarms shall be red: all other alarms shall be amber.

#### 2.16.3 Alarms and Action Logic

#### 2.16.3.1 Shutdown

Simultaneous activation of the audible signal, activation of the visual signal, stopping the engine, and opening the generator main circuit breakers shall be accomplished.

#### 2.16.3.2 Problem

Activation of the visual signal shall be accomplished.

#### 2.16.4 Local Alarm Panel

Device/Condition/ Action/Location/ No. of Manufacturers
Function Offering
Low Coolant Level SD/CP VA 3
Overvoltage Protection SD/CP VA 0 3
Shutdown
Under frequency SD/CP VA 1 Under voltage SD/CP VA 1
Magnetic Pickup Failure SD/CP VA 1
Over current SD/CP VA 1

Page 723 of 947

Short Circuit SD/CP VA 1
Auxiliary Fault Alarm CP VA 1
Audible Alarm CP AA 1
Over current CP VA 1
Oil Pressure Sender Fault CP VA 1
Weak Battery CP VA 1

Section: Appendix DD

A local alarm panel shall be provided with the following shutdown and alarm functions [as indicated] [in accordance with NFPA [99] [110 level [1] [2]] and including the listed Corps of Engineers requirements, mounted either on or adjacent to the engine generator set.

Device/ What/Where/Size NFPA 99 NFPA 110 NFPA 110 Corps of

Condition/ Level 1 Level 2 Engrs Function Required

Shutdowns

W/Alarms

High engine Automatic/ SD/CP VA SD/CP VA SD/CP VA SD VA

temperature jacket water/

cylinder

Low lube-oil Automatic/ SD/CP VA SD/CP VA SD/CP VA SD VA

pressure/

level

Over speed (110% (+ 2%) SD/CP VA SD/CP VA SD/CP VA SD VA

shutdown \$ of rated

alarm speed

Over crank Automatic/ SD/CP VA SD/CP VA SD/CP VA

failure to

to start to start

Air shutdown When used SD/CP VA SD/CP VA

damper

(200-600kW)

Day tank Automatic/Day SD/OPA

overfill Tank/Level (Pump)

limit

indication &

transfer pump

shutdown

(95% volume)

Red emergency Manual Switch SD/CP VA SD/CP VA SD VA

stop switch

Failure to Corps of Engrs.

crank Required

[Day tank] Corps of Engrs.

[Integral Main Required

Fuel Tank1

low fuel

limit Device/

Condition/

indication

(70% volume

remaining)

Alarms

Low lube-oil Pressure/ CP VA CP VA CP VAO CP VA

pressure level

Low fuel Main tank, VA/AA CP VA CP VAO

level 3 hours

remaining

High fuel Integral Main CP VA

Section: Appendix DD

level Fuel Storage

Tank

95% Volume

Low coolant Jacket water CP/VA CP VA CP VA

Pre-high Jacket water/ CP VA CP VA CP VAO CP VA

temperature cylinder

Pre-low CP VA CP VA

lube-oil

pressure

High battery CP VA CP VAO

voltage

Low battery CP VA CP VAO

voltage

Battery AC supply not CP VA CP VAO

charger available

AC failure

Control CP VA CP VAO

switch not

in AUTO

Low starting CP VA CP VAO

air pressure

Low starting CP VA CP VAO

hydraulic pressure

SD - Shut Down

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

O - Optional]

#### 2.16.5 Time-Delay on Alarms

For startup of the engine-generator set, time-delay devices shall be installed bypassing the low lubricating oil pressure alarm during cranking, and the coolant-fluid outlet temperature alarm. The lube-oil time-delay device shall return its alarm to normal status after the engine starts. The coolant time-delay device shall return its alarm to normal status 5 minutes after the engine starts.

#### 2.16.6 Remote Alarm Panel (If Required)

A remote alarm panel shall be provided as indicated. A remote alarm panel shall be provided in accordance with NFPA 99, NFPA 110 and as follows:

Device/Condition/ What/Where/Size NFPA 99 NFPA 110 NFPA 110

Function Level 1 Level 2

Remote annunciator panel Battery powered Alarms

Loads on genset VA

Battery charger VA

malfunction

Low lube-oil Pressure/level VA/AA AA AAO

Low Temperature Jacket water VA/AA AA AAO

High Temperature Jacket water/ VA/AA AA AAO

cvlinder

Low fuel level Main tank, 3 hr VA/AA AA AAO

remaining

Over crank Failure to start VA/AA AA AAO

Over speed VA/AA AA AAO

Pre-high temperature Jacket water/ AA

cylinder

Control switch not in AA

**AUTO** 

Common alarm contacts X X

for local & remote

common alarm

Audible alarm silencing X O

switch

Air shutdown damper When used AA AAO

Common fault alarm AA

X - Required

SD - Shut Down

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

O - Optional]

#### 2.17 ENGINE GENERATOR SET CONTROLS AND INSTRUMENTATION

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions.

#### 2.17.1 Controls

A local control panel shall be provided with controls [as indicated] [in accordance with NFPA 110 level [1] [2]] [and as follows] mounted on the engine generator set. A remote control panel shall be provided [with devices as indicated] [fully redundant to the local control panel] as required.

Device/Condition/ Corps Requirement NFPA 110 NFPA 110 MFG

Function Level 1 Level 2 Offering

Controls

Switch: run/start CP CP/STD

- off/set - auto

Emergency stop switch CP CP/STD

& alarm

Page 726 of 947

Lamp test/indicator test CP CP VA CP VA CP/STD

Common alarm contacts/ X X CP/O

fault relay

Panel lighting CP CP/STD

Section: Appendix DD

Audible alarm & CP

silencing/reset switch

Voltage adjust for voltage CP/

Regulator

Pyrometer display CP

w/selector switch

Remote emergency stop switch CP VA CP VA

Remote fuel shutoff switch

Remote lube-oil shutoff switch

#### 2.17.2 Engine Generator Set Metering and Status Indication

A local panel shall be provided with devices [as indicated] [in accordance with NFPA 110 level [1] [2]] [and as follows] mounted to the engine generator set as indicated. A remote control panel shall be provided [with devices as indicated] [fully redundant to the local control panel] as required.

Device/Condition/Corps Requirement NFPA 110 NFPA 110 MFG

Function Level 1 Level 2 Offering

Genset Status & Metering

Genset supplying load CP VA CP VAO CP VAO

System ready CP/STD

Engine oil pressure CP CP/STD

Engine coolant temperature CP CP/STD

Engine RPM (Tachometer) CP CP/STD

Engine run hours CP CP/STD

Pyrometer display CP

w/selector switch

AC volts (generator), CP CP/STD

3-phase

AC amps (generator), CP CP/STD

3-phase

Generator frequency CP CP/STD

Phase selector switches CP CP/STD

(amps & volts)

Watts/kW CP/VA-O

Voltage Regulator

Adjustment CP

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm O - Optional

STD - Manufacturers Standard Offering

#### **2.18 PANELS**

Each panel shall be of the type necessary to provide specified functions. Panels shall be mounted on the engine generator set base by vibration/shock absorbing type mountings.

Instruments shall be mounted flush or semi flush. Convenient access to the back of instruments shall be provided to facilitate maintenance. Instruments shall be calibrated using recognized industry calibration standards. Each panel shall be provided with a panel identification plate, which clearly identifies the panel function as indicated. Each instrument and device on the panel shall be provided with a plate that clearly identifies the device and its function as indicated. Panels except the remote alarm panel can be combined into a single panel.

#### 2.18.1 Enclosures

Enclosures shall be designed for the application and environment, conforming to NEMA ICS 6, and provided with locking mechanisms, which are keyed alike.

#### 2.18.2 Analog

Analog electrical indicating instruments shall be in accordance with ANSI C39.1 with semi flush mounting. Switchgear, and control-room panel-mounted instruments shall have 250-degree scales with an accuracy of not less than 1 percent. Unit-mounted instruments shall be the manufacturer's standard with an accuracy of not less than 2 percent. The instrument's operating temperature range shall be minus 20 to plus 65 degrees C. Distorted generator output voltage waveform of a crest factor less than 5 shall not affect metering accuracy for phase voltages, hertz and amps.

#### 2.18.3 Electronic

Electronic indicating instruments shall be true RMS indicating, 100 percent solid state, microprocessor controlled to provide all specified functions. Control, logic, and function devices shall be compatible as a system, sealed, dust and water tight, and shall utilize modular components with metal housings and digital instrumentation. An interface module shall be provided to decode serial link data from the electronic panel and translate alarm, fault and status conditions to set of relay contacts. Instrument accuracy shall be not less than 2 percent for unit-mounted devices and 1 percent for control room, panel mounted devices, throughout a temperature range of minus 20 to plus 65 degrees C. Data display shall utilize LED or back lit LCD. Additionally, the display shall provide indication of cycle programming and diagnostic codes for troubleshooting. Numeral height shall be at the minimum height of 1/4 inch or manufacturer specifications whichever is larger.

#### 2.18.4 Parameter Display

Indication or readouts of the lubricating-oil pressure, ac voltmeter, ac ammeter, frequency meter, and coolant temperature.

#### 2.18.5 Exerciser

The exerciser shall be in accordance with Section 16410 AUTOMATIC TRANSFER.

#### 2.19 SURGE PROTECTION

Electrical and electronic components shall be protected from, or designed to withstand the effects of surges from switching and lightning.

#### 2.20 AUTOMATIC ENGINE-GENERATOR-SET SYSTEM OPERATION

Fully automatic operation shall be provided for the following operations: engine-generator set starting and source transfer upon loss of normal source; retransfer upon restoration of the

Section: Appendix DD Page 728 of 947

normal source; sequential starting; and stopping of each engine-generator set after cool down. Devices shall automatically reset after termination of their function.

#### 2.20.1 Automatic Transfer Switch

 Furnish and install automatic transfer switches system(s) with Pole [T], Amps, Volt-60Hz [C]. Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

Codes and Standards - The automatic transfer switches and controls shall conform to the requirements of:

- UL 1008 Standard for Transfer Switch Equipment
- IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; **Automatic Transfer Switching Equipment**
- NFPA 70 National Electrical Code
- NFPA 99 Essential Electrical Systems for Health Care Facilities
- NFPA 110 Emergency and Standby Power Systems
- IEEE Standard 446 IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- NEMA Standard ICS10-1993 (formerly ICS2-447) AC Automatic Transfer Switches
- UL 508 Industrial Control Equipment
- CSA C22.2 No. 178 certification

#### Acceptable Manufacturers

Automatic transfer switches shall be Kohler Specific Breaker Rated - Standard Transition (KSS)/KSSDCTA0\_\_\_S or an approved equal. Any alternate shall be submitted for approval to the consulting engineer and Local Authority Having Jurisdiction at least 10 days prior to bid date. Alternate bids shall include a line-by-line clarification of the specification marked with "D" for deviation; "E" for exception, and "C" for comply.

Mechanically Held Transfer Switch

 The transfer switch shall be electrically operated and mechanically held with double throw construction, and operated by a momentarily energized solenoid-driven mechanism. Main operators shall include over current disconnect devices; linear motors or gears shall not be acceptable.

- All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
- The switch shall be positively locked and unaffected by momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
- All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
- Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 600 amps and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
- Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
- Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.

#### Enclosure

- The ATS shall be furnished in a NEMA \_\_(A) enclosure.
- All standard door mounted switches and long life super bright type indicating LEDs described in section 3 shall be integrated into a flush-mounted, interface membrane or equivalent in the enclosure door for easy viewing & replacement. The panel shall be capable of having manual locking feature to allow the user to lockout all membrane mounted control switches to prevent unauthorized tampering. This cover shall be mounted with hinges and have a latch that may be padlocked. The membrane panel shall be suitable for mounting by others when furnished on open type units.

#### Controller Display and Keypad

 A four line, 20 character LCD display and dynamic 4 button keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through the communications interface port. The

following parameters shall only be adjustable via a password protected programming on the controller (dip switches shall not be acceptable):

- Nominal line voltage and frequency
- · Single or three phase sensing
- Operating parameter protection
- Transfer operating mode configuration (Open transition, Closed transition, or Delayed transition)
- All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

Voltage, Frequency and Phase Rotation Sensing

Section: Appendix DD

 Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored, with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

Parameter	Dropout/Tri	Pickup/Reset
	р	
Under voltage	75 to 98%	85 to 100%
Over voltage	105 to	95 to 100% of
	135%	trip
Under frequency	85 to 99%	95 to 99%
Over frequency	105 to	101 to 105%
	120%	
Voltage	5 to 20%	3% to 18%
unbalance		

- Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 70°C.
- An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
- Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via the communications interface port.

• The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be indicated on the LCD; the service required LED and the annunciation through communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being defeated, if required.

- The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition shall be considered a failed source.
- Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

#### Time Delays

- An adjustable time delay of 0 to 10 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 12 or 24 VDC power supply.
- A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
- A time delay shall be provided on re-transfer to normal. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
- A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
- A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal.
- The controller shall also include the following built-in time delays for the following operations:
  - 1. 0 to 60 minute time delay on failure to acquire the acceptable electrical parameters from the emergency source
  - 2. 0 to 60 minute time delay for a failure to synchronize on an in-phase operation.
  - 3. 60 minute time delay for the load disconnect position for delayed transition operation.

- All time delays shall be adjustable in 1 second increments.
- All time delays shall be adjustable by using the display and keypad or with a remote device connected to the communications interface port through a security-password system.
- All time delays shall be adjustable by using the display and keypad or with a remote device connected to the communications interface port through a security-password system.
- Each time delay shall be identified and a dynamic countdown shall be shown on the display.

#### Additional Features

- The controller shall have 3 levels of security. Level 1 shall allow monitoring of settings and parameters only. The Level 1 shall be capable of restricted with the use of a lockable cover. Level 2 shall allow test functions to be performed and Level 3 shall allow setting of all parameters.
- Membrane-type switches shall be provided for the test functions and be maintained until the end test function is activated. The test function shall be allowed through password security. It shall be possible to defeat the password requirement by way of a circuit board mounted dip switch setting. The test function shall be load, no load or auto test. The auto test function shall request an elapsed time for test. At the completion of this time delay the test shall be automatically ended and a retransfer sequence shall commence. All loaded tests shall be immediately ended and retransfer shall occur if the emergency source fails and the normal source is acceptable.
- A SPDT contact, rated 5 amps at 30 VDC, shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
- Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of two contacts, closed when the ATS is connected to the normal source and two contacts closed, when the ATS is connected to the emergency source.
- LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
- LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency sources

(red), as determined by the voltage, frequency and phase rotation sensing trip and reset settings for each source.

- A membrane switch shall be provided on the membrane panel to test all indicating lights and display when pressed.
- Provide the ability to select "commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
- Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which closes to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad or the communications interface port. A "not-in-auto" LED shall indicate anytime the controller is inhibiting transfer from occurring.
- An in-phase monitor shall be a standard feature in the controller. The monitor shall
  control transfer so that motor load inrush currents do not exceed normal starting
  currents, and shall not require external control of power sources. The in-phase monitor
  shall be specifically designed for and be the product of the ATS manufacturer. The inphase monitor shall be capable of being enabled or disabled for the user interface.
- Engine Exerciser The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to 21 different exercise routines based on a calendar mode. For each routine, the user shall be able to:
  - 1. Enable or disable the routine.
  - 2. Enable or disable transfer of the load during routine.
  - 3. Set the start time,

time of day

day of week

week of month (1st, 2nd, 3rd, 4th, alternate or every)

- 4. Set the duration of the run.
- 5. At the end of the specified loaded exercise duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. All loaded exercises shall be immediately ended and retransfer shall occur if the standby source fails. The next exercise period shall be displayed on the main screen with the type of exercise, time and date. The type of exercise and the time remaining shall be display when the exercise is active. It shall be possible of ending the exercise event with a single button push.
- Date and time The date shall automatically adjust for leap year and the time shall have the capability of automatically adjusting for daylight saving and standard times.
- System Status The controller shall have a default display the following on:
  - 1. System status

- 2. Date, time and type of the next exercise event
- 3. Average voltage of the preferred and standby sources
- Scrolling through the displays shall indicate the following:
  - Line to line and line to neutral voltages for both sources
  - 2. Frequency of each source
  - 3. Load current for each phase
  - 4. Single or three phase operation
  - 5. Type of transition
  - 6. Preferred source
  - 7. Commit or no commit modes of operation
  - 8. Source/source mode (Utility/Gen; Gen/Gen; Utility/Utility)
  - 9. In phase monitor enable/disable
  - 10. Phase rotation
  - 11. Date and time
- Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual, are not permissible.
- Self Diagnostics The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
- Communications Interface The controller shall be capable of interfacing, through a
  standard communications with a network of transfer switches and generators. It shall
  be able to be connected via an RS-485 serial communication (up to 4000 ft. direct
  connect or multi-drop configuration), an Ethernet connectivity (over standard 10baseT
  Ethernet networks utilizing a RJ-45 port or remotely utilizing a dial-up modem). This
  module shall allow for seamless integration of existing or new communication transfer
  devices and generators. Monitoring software shall allow for the viewing, control and
  setup of parameters of the genset and transfer switch network through a standard
  personal computer utilizing current Microsoft operating systems. Separate and
  specific transfer switch software interfaces shall not be acceptable.
- The transfer switch shall also be able to interface to 3rd party applications using Modbus RTU and Modbus TCP/IP open standard protocols utilizing Modbus register maps. <u>Proprietary protocols shall not be acceptable.</u>
- The controller shall contain a USB port for downloading the controller's parameters and settings; exercise event schedules; maintenance records and event history. The file designator shall be the unique serial number of the transfer switch.

Data Logging - The controller shall have the ability to log data and to maintain the
last 2000 events, even in the event of total power loss. The following events shall
be time and date stamped and maintained in a non-volatile memory. The
controller shall be able to display up to the last 99 events. The remaining events
shall be downloadable to be displayed on a computer.

Event Logging

Section: Appendix DD

Data, date and time indication of any event.

2. Statistical Data

Total number of transfers.\*

Total number of fail to transfers.\*

Total number of transfers due to preferred source failure.\*

Total number of minutes of operation.\*

Total number of minutes in the standby source.\*

Total number of minutes not in the preferred source\*

Normal to emergency transfer time

Emergency to normal transfer time

System start date

Last maintenance date

- \* The statistical data shall be held in two registers. One register shall contain data since start up and the second register shall contain data from the last maintenance reset.
- External DC Power Supply An optional provision shall be available to connect up to two external 12/24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead for extended periods of time. This module shall contain reverse battery connection indication and circuit protection.

#### Tests and Certification

- Upon request, the manufacturer shall provide a notarized letter certifying compliance
  with all of the requirements of this specification including compliance with the above
  codes and standards. The certification shall identify, by serial number(s), the
  equipment involved. No exceptions to the specifications, other than those stipulated
  at the time of the submittal, shall be included in the certification.
- The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, and installation and servicing in accordance with ISO 9001.

#### Service Representation

 The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

Automatic transfer switches shall be in accordance with Section 16410 AUTOMATIC TRANSFER.

#### 2.20.2 Monitoring and Transfer

Devices shall be provided to monitor voltage and frequency for the normal power source and each engine generator set, and control transfer from the normal source and retransfer upon restoration of the normal source. Functions, actuation, and time delays shall be as described in Section 16410 AUTOMATIC TRANSFER.

#### 2.21 MANUAL ENGINE-GENERATOR SET SYSTEM OPERATION

Complete facilities shall be provided for manual starting and testing of each set without load, loading and unloading of each set.

#### 2.22 BASE

The base shall be constructed of steel. The base shall be designed to rigidly support the engine-generator set, ensure permanent alignment of all rotating parts, be arranged to provide easy access to allow changing of lube-oil, and ensure that alignment will be maintained during shipping and normal operation. The base shall permit skidding in any direction during installation and shall be provided with suitable holes for foundation bolts. The base shall also withstand and mitigate the effects of synchronous vibration of the engine and generator, and shall be provided with suitable holes for anchor bolts and jacking screws for leveling. The base shall be mounted on spring isolators rated for Fort Campbell seismic conditions.

#### 2.23 THERMAL INSULATION

Thermal insulation shall be as specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

#### 2.24 PAINTING AND FINISHING

The engine-generator set shall be cleaned, primed and painted in accordance with the manufacturer's standard color and practice.

#### 2.25 FACTORY INSPECTION AND TESTS

Factory inspection and tests shall be performed on each engine-generator set proposed to meet this specification section. Inspections shall be completed and necessary repairs made prior to testing. Inspectors shall look for leaks, looseness, defects in components, and proper assembly. Factory tests shall be NEMA MG 1 routine tests and the manufacturer's routine tests.

#### PART 3 EXECUTION 3.1 GENERAL INSTALLATION

Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and IEEE C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

#### 3.2 PIPING INSTALLATION

#### 3.2.1 General

Piping shall be non-welded (threaded). Connections at valves shall be threaded. Connections at equipment shall be threaded to the diesel engine may be threaded if the diesel-engine manufacturer's standard connection is threaded. Except as otherwise specified, threaded fittings shall be utilized to allow for complete dismantling and removal of each piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to all equipment shall be made with flexible connectors. Pipes extending through the roof shall be properly flashed. Piping shall be installed clear of windows, doors, and openings to permit thermal expansion and contraction without damage to joints or hangers, and with a 15 mm (1/2 inch) drain valve at each low point.

#### 3.2.2 Supports

Hangers, inserts, and supports shall be of sufficient size to accommodate any insulation and shall conform to MSS SP-58 and MSS SP-69. Supports shall be spaced not more than 2.1 m (6 feet) on center for pipes 50 mm (2 inches) in diameter or less, not more than 3.6 m (12 feet) on center for pipes larger than 50 mm (2 inches) (2 inches) but no larger than 100 mm, (4 inches,) and not more than 5.2 m (17 feet) on center for pipes larger than 100 mm (4 inches) in diameter. Supports shall be provided at pipe bends or change of direction.

#### 3.2.3 Deleted

#### 3.2.4 Cleaning

After fabrication and before assembly, piping interiors sh

#### 3.2.5 Pipe Sleeves

Pipes passing through construction such as ceilings, floors, or walls shall be fitted with sleeves. Each sleeve shall extend through and be securely fastened in its respective structure and shall be cut flush with each surface. The structure shall be built tightly to the sleeve. The inside diameter of each sleeve shall be 15 mm, (1/2 inch,) and where pipes pass through combustible materials, 25 mm (1 inch) larger than the outside diameter of the passing pipe or pipe covering.

#### 3.3 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16415 ELECTRICAL WORK, INTERIOR.

#### 3.3.1 Vibration Isolation

Flexible fittings shall be provided for all conduit, cable trays, and raceways attached to engine-generator sets. Metallic conductor cables installed on the engine generator set and from the engine generator set to equipment not mounted on the engine generator set shall be flexible stranded conductor. Terminations of conductors on the engine generator set shall be crimp-type terminals or lugs.

#### 3.4 FIELD PAINTING

Field painting shall be as specified in Section 09900 PAINTING, GENERAL.

#### **ONSITE INSPECTION AND TESTS**

Section: Appendix DD

### NOTE: ALL ONSITE TESTING WILL BE AT NAME PLATE RATING OF THE GENERATOR SET

- Site Tests. The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
- Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
- Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
- Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
- Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

#### 3.5.1 Test Conditions

#### 3.5.1.1 Data

Measurements shall be made and recorded of parameters necessary to verify that each set meets specified parameters. If the results of any test step are not satisfactory, adjustments or replacements shall be made and the step repeated until satisfactory results are obtained. Unless otherwise indicated, data shall be taken during engine-generator set operation and recorded in 15 minute intervals and shall include: readings of engine-generator set meters and gauges for electrical and power parameters; oil pressure; ambient temperature; and engine temperatures available from meters and gauges supplied as permanent equipment on the engine-generator set. In the following tests where measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Electrical measurements shall be performed in accordance with IEEE Std 120. Definitions and terms are in accordance with IEEE Std 100. Temperature limits in the rating of electrical equipment and for the evaluation of electrical insulation shall be in accordance with IEEE Std 1.

#### 3.5.1.2 Power Factor

Engine-generator set operating tests shall be made utilizing a load with 0.8-power factor for all 3-phase installations; a unity of 1.0 power factor shall be used on all single-phase installations.

#### 3.5.1.3 Contractor Supplied Items

The Contractor shall provide all equipment and supplies required for inspections and tests including fuel, test instruments, cables, test leads, and load banks at the specified power factors.

#### 3.5.1.4 Instruments

Readings of panel gauges, meters, displays, and instruments, provided under this specification shall be verified during test runs by test instruments of precision and accuracy greater than the tested items. Test instrument accuracy shall be at least as follows: current, 1.5%; voltage, 1.5%; real power, 1.5%; reactive power, 1.5%; power factor, 3%; frequency, 0.5%. Test instruments shall be calibrated by a recognized standards laboratory within 30 days prior to testing.

#### 3.5.1.5 Sequence

The sequence of testing shall be as specified in the approved testing plan unless variance in authorized by the Contracting Officer and Local Authority Having Jurisdiction. Field-testing shall be performed in the presence of the Contracting Officer and Local Authority Having Jurisdiction. Tests may be scheduled and sequenced in order to optimize run-time periods; however the following general order of testing shall be followed: Construction Tests; Inspections; Safety run Tests; and Performance Tests and Final Inspection.

#### 3.5.2 Construction Tests

Individual component and equipment functional tests for fuel piping, coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the engine-generator set manufacturer shall be performed prior to connection to the engine-generator set.

#### 3.5.2.1 Piping Test

a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the out flowing fluid has no obvious sediment or emulsion. b. Fuel piping which is external to the engine-generator set shall be tested in accordance with NFPA 30. All remaining piping, which is external to the engine generator set shall be pressure tested with air pressure at 150% of the maximum anticipated working pressure, but in no case less than 1 MPa, (150 psig,) for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

#### 3.5.2.2 Electrical Equipment Tests

a. Low-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the [automatic transfer switch] [panel-board] [main disconnect switch] [distribution bus] [\_\_\_\_\_]. Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energizing. The test voltage shall be 500 volts dc,

applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be: R in megohms = (rated voltage in kV + 1) x 304,800/(length of cable in meters). (R in megohms = (rated voltage in kV + 1) x 1000/(length of cable in feet) Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

- a. Medium-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the [generator switchgear] [main disconnect switch] [distribution bus]. After insulation and before the operating test or connection to an existing system, the medium-voltage cable system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shielding or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment.
- b. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with NEMA WC 7 or NEMA WC 8 for the particular type of cable installed, except that 28 kV and 35 kV insulation test voltages shall be in accordance with either AEIC CS5 or AEIC CS6 as applicable, and shall not exceed the recommendations of IEEE Std 404 for cable joints and IEEE Std 48 for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the contractor shall make necessary repairs or replace cables as directed. Repaired or replaced cables shall be retested.
- c. Ground-Resistance Tests. The resistance of [each grounding electrode] [each grounding electrode system] [the ground mat] [the ground ring] shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

1) Single rod electro	de - [25] [	] ohms
2) Multiple rod electr 3) Ground mat - [	odes - [ ] ohms.	] ohms.

- d. Circuit breakers and switchgear shall be examined and tested in accordance with manufacturer's published instructions for functional testing.
- 3.5.3 Inspections

The following inspections shall be performed jointly by the Contracting Officer the Contractor and Local Authority Having Jurisdiction, after complete installation of each engine-generator set and its associated equipment, and prior to startup of the engine-generator set. Checks applicable to the installation shall be performed. The results of those which are physical inspections (I) shall be documented by the Contractor and submitted in accordance with paragraph SUBMITTALS. The Contractor shall present manufacturer's data for the inspections designated (D) at the time of inspection. Inspections shall verify that equipment type; features, accessibility, installation and condition are in accordance with the contract specification. Manufacturer's statements shall certify provision of features, which cannot be verified visually.

- 1. Drive belts. (I)
- 2. Governor type and features. (I)

- 3. Engine timing mark. (I)
- 4. Starting motor. (I)
- 5. Starting aids. (I)
- 6. Coolant type and concentration. (D)
- 7. Radiator drains. (I)
- 8. Block coolant drains. (I)
- 9. Coolant fill level. (I)
- 10. Coolant line connections. (I)
- 11. Coolant hoses. (I)
- 12. Combustion air filter. (I)
- 13. Intake air silencer. (I)
- 14. Lube oil type. (D)
- 15. Lube oil drain. (I)
- 16. Lube-oil filter. (I)
- 17. Lube-oil-fill level. (I)
- 18. Lube-oil line connections. (I)
- 19. Lube-oil lines. (I)

20. Fuel type. (D) 21. Fuel-level. (I) 22. Fuel-line connections. (I) 23. Fuel lines. (I) 24. Fuel filter. (I) 25. Access for maintenance. (I) 26. Voltage regulator. (I) 27. Battery-charger connections. (I) 28. Wiring & terminations. (I) 29. Instrumentation. (I) 30. Hazards to personnel. (I) 31. Base. (I) 32. Nameplates. (I) 33. Paint. (I) 34. Exhaust system. (I) 35. Access provided to controls. (I) 36. Enclosure. (I)

37. Engine & generator mounting bolts (proper

- 3.5.4 Safety Run Tests
- a. Perform and record engine manufacturer's recommended pre-starting checks and inspections.
- b. Start the engine, record the starting time, make and record engine manufacturer's afterstarting checks and inspections during a reasonable warm-up period.
- c. Activate the manual emergency stop switch and verify that the engine stops.
- d. Remove the high and pre-high lubricating oil temperature sensing elements from the engine and temporarily install temperature gauge in their normal locations on the engine

Page 743 of 947

(required for safety, not for recorded data). Where necessary, provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.

- e. Start the engine, record the starting time, make and record engine manufacturer's afterstarting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize. Monitor the temporarily installed temperature gauges. If temperature reading exceeds the value for an alarm condition, activate the manual emergency stop switch.
- f. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- g. Remove the high and pre-high coolant temperature sensing elements from the engine and temporarily seal their normal location on the engine and temporarily install temperature gauges in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- h. Start the engine, record the starting time, make and record engine manufacturer's afterstarting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize.
- i. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down.
- Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- j. Start the engine, record the starting time, make and record engine manufacturer's afterstarting checks and inspections during a reasonable warm-up period.
- k. Operate the engine generator-set for at least 30 minutes at 100 percent of service load.
- I. Verify proper operation of the governor and voltage regulator.
- m. Verify proper operation and set points of gauges and instruments.
- n. Verify proper operation of ancillary equipment. o. Manually adjust the governor to increase engine speed past the over-speed limit. Record the RPM at which the engine shuts down.
- p. Start the engine, record the starting time, make and record engine manufacturer's afterstarting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of rated load.

Section: Appendix DD Page 744 of 947

g. Manually fill the day tank to a level above the overfill limit. Record the level at which the overfill alarm sounds. Verify shutdown of the fuel transfer pump. Drain the day tank down below the overfill limit.

- r. Shut down the engine. Remove the time-delay low lube oil pressure alarm bypass and try to start the engine. Record the results.
- Attach a manifold to the engine oil system (at the oil sensor pressure port) that contains a shutoff valve in series with a connection for the engine's oil pressure sensor followed by an oil pressure gauge ending with a bleed valve. The engine's oil pressure sensor shall be moved from the engine to the manifold and its normal location on the engine temporarily sealed. The manifold shutoff valve shall be open and bleed valve closed.
- t. Start the engine, record the starting time, make and record all engine manufacturer's afterstarting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of service load.
- Close the manifold shutoff valve. Slowly allow the pressure in the manifold to bleed off through the bleed valve while watching the pressure gauge. Record the pressure at which the engine shuts down. Catch oil spillage from the bleed valve in a container. Add the oil from the container back to the engine, remove the manifold, and reinstall the engine's oil pressure sensor on the engine.
- v. Start the engine, record the starting time, make and record all engine manufacturer's afterstarting checks and inspections and operate the engine generator-set for at least 15 minutes at 100% of service load. Record the maximum sound level in each frequency band at a distance of 22.9 m ((75 feet)) from the end of the exhaust and air intake piping directly along the path of intake and discharge horizontal piping; or at a radius of [ 1 [22.9 m][10.7 m] ([75][35] feet) from the engine at 45 degrees apart in all directions for vertical piping. The measurements should comply with the paragraph SOUND LIMITATIONS. [If a sound limiting enclosure is provided, the enclosure, the muffler, and intake silencer shall be modified or replaced as required to meet the sound requirements contained within this specification.] [If a sound limiting enclosure is not provided, the muffler and air intake silencer shall be modified or replaced as required to meet the sound limitations of this specification. If the sound limitations cannot be obtained by modifying or replacing the muffler and air intact silencer, the contractor shall notify the Contracting Officer and provide a recommendation for meeting the sound limitations.]
- w. Manually drain off fuel slowly from the day tank to empty it to below the low fuel level limit and record the level at which the audible alarm sounds. Add fuel back to the day tank to fill it above low-level alarm limits.

#### 3.5.5 Performance Tests

#### 3.5.5.1 Continuous Engine Load Run Test

The engine-generator set and ancillary systems shall be tested at service load to: demonstrate durability; verify that heat of extended operation does not adversely affect or cause failure in any part of the system; and check all parts of the system. If the engine load

Page 745 of 947

run test is interrupted for any reason, the entire test shall be repeated. The engine load run test shall be accomplished principally during daylight hours, with an average ambient temperature of 35 degrees C, during the month of July. After each change in load in the following test, measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the allowable range. Measurements are to be recorded after stabilization of an enginegenerator set parameter (voltage, frequency, current, temperature, etc.). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Data taken at 15 minutes intervals shall include the following:

- a. Electrical: Output amperes, voltage, real and reactive power, power factor, frequency.
- b. Pressure: Lube-oil.
- c. Temperature: Coolant.

Section: Appendix DD

Lube-oil.

Ambient.

- (1) Perform and record engine manufacturer's recommended pre-starting checks and inspections. Include as a minimum checking of coolant fluid, fuel, and lube-oil levels.
- (2) Start the engine; make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- (3) Operate the engine generator-set for at least 2 hours at 75 percent of service load.
- (4) Increase load to 100% of service load and operate the engine generator-set for at least 2 hours.
- (5) Remove load from the engine-generator set.

#### 3.5.5.2 Load Acceptance Test

Engine manufacturer's recommended pre-starting checks and inspections shall be performed and recorded. The engine shall be started, and engine manufacturer's after-starting checks and inspections made and recorded during a reasonable warm-up period. For the following steps, the output line-line and line-neutral voltages and frequency shall be recorded after performing each step instruction (after stabilization of voltage and frequency). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings.

- a. Apply load in steps no larger than the Maximum Step Load Increase to load the enginegenerator set to 100 of Service Load.
- b. Verify that the engine-generator set responds to the load

Section: Appendix DD Page 746 of 947

c. Verify that the engine-generator set responds to the load addition and that the output voltage returns to and stabilizes within the rated bandwidths.

#### 3.5.6 Automatic Operation Tests for Stand-Alone Operation

The automatic loading system shall be tested to demonstrate automatic starting, and loading and unloading of each engine-generator set. The loads for this test shall utilize the actual loads to be served, and the loading sequence shall be the indicated sequence. Perform this test for a minimum of two successive, successful tests. This test shall be for a period of 2 hours. Data taken shall include the following:

- a. Ambient temperature (at 15 minute intervals).
- b. Generator output current (before and after load changes).
- c Generator output voltage (before and after load changes).
- d. Generator output frequency (before and after load changes.)
- 1. Initiate loss of the primary power source and verify automatic sequence of operation.
- 2. Restore the primary power source and verify sequence of operation.
- 3. Verify resetting of controls to normal.

#### 3.6 FINAL INSPECTION AND TESTING

During final inspection and testing procedures, Fort Campbell Directorate of Public Works, Authority Having Jurisdiction shall be scheduled and in attendance. Approval shall not occur without this observation and participation. Testing procedures shall include the following:

- a. Start the engine, record the starting time, make and record all engine manufacturer's afterstarting checks and inspections during a reasonable warm-up period.
- b. Increase the load in steps no greater than the maximum step load increase to 100% of service load, and operate the engine-generator set for at least 30 minutes. Measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the same range as previous measurements and is within the required range.
- c. Remove load and shut down the engine-generator set after the recommended cool down period. Perform the pre-test inspections and take necessary corrective actions.
- d. Remove the lube oil filter and have the oil and filter examined by the engine manufacturer for excessive metal, abrasive foreign particles, etc. Any corrective action shall be verified for effectiveness by running the engine for 4 hours at service load, then re-examining the oil and filter.
- e. Remove the fuel filter and examine the filter for trash, abrasive foreign particles, etc.

Section: Appendix DD Page 747 of 947

f. Visually inspect and check engine and generator mounting bolts for tightness and visible damage.

g. Replace air, oil, and fuel filters with new filters.

#### 3.7 MANUFACTURER'S FIELD SERVICE

#### 3.7.1 Onsite Training

The Contractor shall conduct training course for Fort Campbell Authority Having Jurisdiction and operating staff as designated by the Contracting Officer. The training period shall consist of a total 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, programming of all components, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations such as oil change, oil filter change, and air filter change.

#### 3.7.2 Manufacturer's Representative

The engine generator-set manufacturer shall furnish a factory certified, qualified representative to supervise the installation of the engine generator-set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment.

#### Warranty and Maintenance

- The generator set shall include a standard one year warranty to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of startup. Optional warranties shall be available upon request.
- The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

#### 3.8 INSTRUCTIONS

Two sets of instructions shall be typed and framed under weatherproof laminated plastic, and posted side-by-side where directed before acceptance. First set of instructions shall include a one-line diagram, wiring and control diagrams and a complete layout of the system. Second set of instructions shall include the condensed operating instructions describing manufacturer's pre-start checklist and precautions; start procedures for test-mode, manualstart mode, and automatic-start mode (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment and automatic transfer switches

Page 748 of 947

#### 3.9 ACCEPTANCE

Final acceptance of the engine-generator set will not be given until the Contractor has successfully completed all tests and after all defects in installation material or operation have been corrected.

#### Section 26 41 01.00 10 Lightning Protection System

#### Ft. Campbell Requirements:

Section: Appendix DD

#### **Lightning Protection Systems and Snow Guards**

- 1. Facilities Requiring Lightning Protection Systems
- 1.1 Priority level 1. Must have lightning protection.
- a) Any facility involved with children, example schools or child development structures
  - b) Communications facilities
  - c) Facilities which houses large amounts of computer processing equipment
  - d) Faculties which are in isolated areas away from other large structures or wooded areas.
- 1.2 Priority level 2. These structures are to be evaluated on an as-needed basis with the recommendations from Ft. Campbell's fire marshal and DPW.
  - a) Barracks
  - b) Maintenance facilities
  - c) Family Housing
  - d) Administration buildings

#### 2. Lightning Protection System Installation Methods

- 2.1 Lightning protection equipment manufacturer's mechanical clamps/supports for air terminal base and roof conductor installation shall be the preferred method for all our projects. The use of adhesives in lieu of mechanical clamps/supports is an acceptable method for lightning protection equipment installation provided the following are met:
  - a) Roof design/construction does not allow or makes it physically impossible for the mechanical clamps to be utilized.

- b) A variance from the original contract requirements is submitted by the Contractor indicating the type of adhesive and the reason for such variance. Corps must approve.
- c) The proposed adhesive is listed as an approved compound by both the lightning system and roofing manufacturer.
- d) All prep-work and application requirements are carefully followed in accordance with adhesive and roofing manufacturer instructions.
- 2.2 The use of the S-5 clamps (Cube) is an acceptable method for lightning protection equipment support provided the following are met:
  - a) 1.2 a) above is met.
  - b) A variance from the original contract requirements is submitted by the Contractor, with installation details, and the reason for such variance. Corps must approve.
  - c) The cube is used only as a means for support of the lightning protection equipment and does not compromise the "Lightning Protection System" requirements listed under NFPA 70, NFPA 780, UL 96, and UL 96A.
  - d) The cube does not void roofing manufacturer's warranty.

#### 3.0 Snow Guards

Regardless of the manner or configuration of the mounting of a lightning protection system and equipment, the components are not intended to withstand the forces exerted by masses of ice and snow shifting on the roof. In those instances where lightning protection systems will be exposed to such forces, we recommend the installation of snow guards or snow guard systems

Section 26 56 00 Exterior Lighting

#### Instructions to Designer

All exterior lighting (parking lot, street, building, etc.) shall be either 120, 208, or 277 Volt. 480-Volt lighting is not permitted. Safety is an issue when working on this high of a voltage, especially in inclement weather.

Exterior lighting (parking lot, street, building, etc) shall be Metal Halide or 100, 150, or 400 watt Mercury Vapor. Use 1500-watt metal halide on athletic fields. No High-Pressure Sodium lighting will be permitted.

All exterior street, building and flood lights, shall meet the requirements of UFC 3-530-01, Chapter 7 to avoid conflict with night vision goggle use. The intent is to minimize light pollution in the area and to minimize the chances of pilots looking directly into the beams of nearby lights.

Parking lot lighting control shall be by photocell. Timers will not be permitted. This control shall be by means of one photocell per fixture or one photocell per pole. One photocell per pole is acceptable except for sensitive areas like hospitals, PX, and schools (all lights are out if photocell fails). Provide one photocell per fixture in those areas. Direct burial is acceptable for street light circuits.

Parking lot lighting fixtures shall be COE standard type EH1 and as indicated above.

#### Instructions to Designer

1. Include all features into project design and contract documents specifications as they apply.

# TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 27 Communications

Section 27 10 00 Building Telecommunications Cabling System

#### Ft. Campbell Requirements:

#### General:

The Director of the Network Enterprise Center, Fort Campbell (NEC) will enforce the following standards for <u>the Ft Campbell Information Technology (IT) Technical Design Guide:</u>

- N.E.C. will review and approve all proposed voice-data communications requirements for fiber, copper, and all requirements for connectivity into Fort Campbell's telecommunications infrastructure.
- N.E.C. requires all contracts performing telecommunications construction or deconstruction by a civilian contractor utilize the Installation Information Infracstructure Architecture (I3A) Technical Criteria dated February 2010 standard requirements. Any and all requirements in these standards apply equally to on-site employees and to US Government contractors.
- N.E.C. requires designers to coordinate with tenant organizations and ensure that all communications requirements are being met in accordance with this standard.

#### Contractor Requirements:

Section: Appendix DD

 The Contractor is required to contact the N.E.C. as required in the Fort Campbell IT Technical Design Guide prior to connecting any facility on Fort Campbell to the telecommunications infrastructure.

 Plans and specification shall require Contractors to notify the N.E.C. when renovating, modifying, or deconstructing communications materials in any existing structures on Fort Campbell, KY. This also applies to new facilities or any Major Construction Army (MCA) Projects at Fort Campbell, KY.

#### Other:

- <u>Secret Internet Protocol Router Network (SIPRNET) Technical Implementation Criteria,</u> dated October 2010.
- Per DAIM-FD Memorandum dated 3 November 2000, Army-wide policy applies to individual subscriber communications (barracks Soldier rooms) infrastructure that supports MILCON barracks construction. Project funds are allowable to install the cabling from the individual Soldier room to a central telephone closet. Beyond that point, AAFES through their commercial phone service provider will make connection.
- All exterior communications infrastructure to the designated central closet is the responsibility of AAFES through their designated service provider. This includes all outside cable plant (cable, duct, and manholes), equipment shelters, and switches.

#### Instructions to Designers:

#### **Design Requirements:**

- 1. All detailed requirements contained in the Fort Campbell Information Technology (IT) Technical Design Guide (Appendix H) document shall be incorporated into all design and construction documents. Any additional requirements not addressed in the document standards will conform to the ANSI/TIA/EIA Standard.
- 2. All Designs shall be coordinated with N.E.C. and submitted to N.E.C. for review and approval prior to start of construction to ensure that the requested or designed wiring is available in the existing system infrastructure.
- 3. All new data and voice communications lines shall be installed underground. If and when overhead service has been approved by the NEC Infrastructure Manager, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

**Return to Table of Contents** 

#### **TECHNICAL DESIGN GUIDE**

## CHAPTER 3 Technical Requirements and Instructions Division 28 Electronic Safety and Security

#### Section 28 16 01.00 10 Small Intrusion Detection System

#### Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with CAM Reg 420-4.

In addition to a phone jack inside the arms vault, place an additional phone jack outside the arms vault. The phone line in the arms vault shall be a single line only (no multiple lines on the same phone).

#### **Instructions to Designers:**

- 1. Installation of ICIDS Equipment in secure communications rooms shall be in accordance with instructions found in <a href="Section 27 10 00 Building Telecommunications Cabling System">Section 27 10 00 Building Telecommunications Cabling System</a>.
- Installation of ICIDS Equipment in Arms Room shall be in accordance with the following instructions and Floor Plan Sketch:
- Modify project specifications to insure Contractor will provide all materials (excluding the RADC, Keypad, LED indicator lamp, and sensors)
- Modify specifications to insure Contractor will schedule a meeting with the Alarm Administrator prior to commencement of work (270) 798-3990/1225/7587 Note: Type & placement of sensors will be noted at meeting.
  - 1. Mount the Remote Area Data Collector (RADC) to the same side as the interior door opens, approximately two feet to the left or right of the door and five feet up from the floor. (Physical Security office will provide the RADC.)
  - 2. Mount a four square box to the left or right of door as in step one approximately one foot from the doorframe and five feet up from the floor. Half inch EMT must be run from the four square box to the bottom of the RADC can. This is for the mounting the Keypad. (Physical Security will provide and install the keypad.)

Page 753 of 947

3. A foursquare must be mounted to the ceiling (center) of the Arms Room or rear wall facing the door depending on the type of motion sensor to be used. Half inch EMT must be run from the foursquare to the RADC can (top). Note: Placement of sensors will be noted at time of meeting. (Physical Security will provide and install sensors)

- 4. Drill a half inch hole approximately eighteen inches above and centered on the arms room door to outside for mounting of the LED indicator lamp. (Physical Security will provide and install the LED.) Mount a foursquare box over the drilled hole and run half inch EMT from box to the RADC can (top).
- 5. Dedicated 120 VAC power must be run to the RADC can through ½" or ¾" EMT.
- 6. A dedicated phone line must also be run to the RADC can. This wire can be run using the conduit from either sensor.
- 7. A four conductor 22 AWG wire must be run from motion sensor to the RADC.
- 8. A two conductor 22 AWG wire must be run from foursquare above arms room door to the RADC. This is for the Balanced Magnetic Switch (BMS) for the door. (Physical Security will provide and install the BMS.)
- 9. A two conductor 22 AWG wire must be run from the foursquare above door to the foursquare for the keypad installation. This is for the LED indicator to be mounted on the outside of the arms room.
- 10. A two conductor 22 AWG wire must be run from the foursquare, for the keypad, to the RADC.
- 11. A two conductor shielded 24 AWG wire must be run from the foursquare for the keypad to the RADC.

NOTE: Leave approximately four feet of wire at both ends.

#### Conductors

Section: Appendix DD

11.1 Signal wiring: Type of wire to be used (another manufacturer's wire, of equal quality, can be substituted).

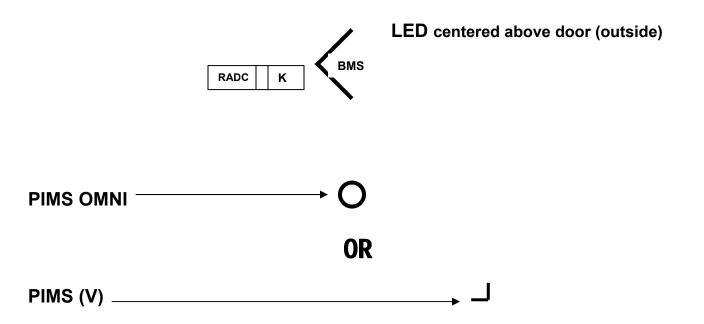
West Penn 220 = 2 conductor 22 AWG

West Penn 240 = 4 conductor 22 AWG

West Penn 2401 = 2 conductor, 24 AWG, shielded

11.2 Power wiring: Black, Red, Green- 12 AWG, stranded, to RADC.

## Installation Floor Plan Sketch ICIDS Equipment Typical Arms Room



#### Section 28 31 76 Interior Fire Alarm System and Mass Notification System

#### Ft. Campbell Requirements:

#### General:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit per CAM Regulation 420-4, Quality Assurance "Electrical" Inspection Standards (see Section 26 00 00.00 20 Basic Electrical Materials and Methods).

All building designs which have a fire alarm system shall have an exterior strobe light alarm device mounted on the street side of the building's exterior. The strobe is to act as a visual indicator to responding fire crew. Response time is decreased since the crew does not need to find the actual building number.

If using flow switch, use only electric bell; do not specify motor gong; Be sure sprinkler alarm specification and alarm specification agree.

No tower is to be designed with out jockey pumps.

Ft. Campbell's fire truck ladder is 85 feet long.

Utilize looped and grid systems.

#### Fire Alarm Systems:

The Fire Alarm Control Panel shall be fully compatible with the existing King-Fisher Industrial Radio Alarm Control System (IRACS) presently in use at Fort Campbell. The fire alarm AM transmitter shall be Government furnished, contractor installed.

An addressable system is fine in almost any building, there are several circumstances where an addressable system is not really necessary and ends up costing more to install and maintain than it is really worth. Therefore, addressable systems shall be installed in all barracks and hangar type buildings. Non-addressable systems will be used in maintenance facilities as well as dining facilities. Non-addressable systems shall also be designed/installed in admin buildings, which are smaller or equal to 15,000 SF with 40-50 rooms. Any admin buildings which exceed these parameters shall receive an addressable system. Panel boxes within a building should be keyed alike.

Fire detection and alarm systems shall be able to be programmed from the control panel and shall not require a peripheral device (such as a laptop computer) to program them.

Do not design remote fire alarm annunciators into the fire detection and alarm system.

Fire alarm control panels shall be installed only in electrical rooms with access from the outside of the building.

Ensure that smoke detector locations shown on drawings comply with the appropriate NFPA requirements. Contractors typically simply scale locations off drawings without verifying whether the locations actually comply with NFPA location/spacing criteria.

Do not install smoke detectors in vehicle maintenance areas due to false alarm problems. Automatic fire detectors in these areas shall be heat detectors.

Ensure that sleeping room smoke detectors in barracks comply with the requirements of Military Handbook 1008C (10 June 1997), i.e., local alarm only, 120 V, powered from the building's power system. Do not put all detectors on the same circuit. This will cause all detectors downstream of an open circuit to be disabled.

Contractor shall provide a set of fire alarm schematic diagrams and O&M manuals in the electrical or mechanical room (wherever the control panel is located). Each zone shall be identified at fire alarm control panel.

Identify fire alarm zones by means of a diagram posted at the building entrance.

Provide a minimum of 2 days of training for the fire detection and alarm system.

Building designs which have a fire alarm system shall have an exterior strobe light alarm device mounted on the outside of the building on the street side. The strobe acts as a visual indication to the responding firemen. It decreases response time because the firemen don't have to waste time hunting for building numbers.

The fire alarm system and mass notification system should be separate systems. The mass notification system should be designed per UFC 4-021-01, Chapter 5.

Fire Alarm systems shall be one of the following brand names:

Firelite Siemens Quick Start GE

**Return to Table of Contents** 

## TECHNICAL DESIGN GUIDE CHAPTER 3 Technical Requirements and Instructions Division 31 Earthwork

Section 31 23 00.00 20 Excavation and Fill

## Ft. Campbell Requirements:

Ft. Campbell requires contractors have buried utilities marked prior to starting any excavation/digging. Fort Campbell does not issue dig permits. Fort Campbell has stopped using dig permits. Instead, Tennessee One Call is now being used to locate buried utilities prior to digging/excavation (800-351-1111). See <a href="Appendix C">Appendix C</a> for further information. If contractor cuts utility lines after being marked or does not get them marked he should be responsible for making immediate repairs (to be coordinated with the appropriate Government maintenance entity or be billed for repairs if the Government makes the repairs.

If contractor cuts utility lines after being marked or does not get them marked, he is responsible for making **immediate** repairs (to be coordinated with the appropriate Government maintenance entity) or be billed for repairs if the Government makes the repairs. Repairs shall be made to the satisfaction of the appropriate government entity.

Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Avoid locating new utility lines under pavement where possible. When utilities are required to cross under roads/streets, boring is required (no cutting of pavement is to be done). Exceptions can be granted with written approval of the Director of Public Works. When underground utilities are sleeved under roadways, railways, runways, sleeves shall be

extended a minimum of 10 feet beyond the roadway on both sides to protect lines from

## **Instructions to Designers:**

penetration by new road signs, poles, etc.

Section: Appendix DD

- Meet with DPW utility people to get exact locations of utilities. Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with DPW as soon as possible during the design process. OMA projects shall include in the contract emergency phone numbers for each utility impacted.
- 2. Specifications Demolition section paragraphs shall incorporate the permit and demolition requirements at all construction projects.

## Section 31 31 16 Soil Treatment for Subterranian Termite Control

## Ft. Campbell Requirements:

Termite treatment measures shall be provided on <u>ALL</u> new construction projects.

Environmental quality shall be maintained in delivery, storage, application, and protection of chemicals in accordance with Ft. Campbell policies and procedures.

## Instructions to Designers:

- 1. Point of Contact is Ed Legere at 270-798-3110.
- 2. See Appendix A for environmental requirements.
- 3. UFGS 31 31 16, paragraphs shall be included at all new construction (and additions) projects.

**Return to Division of Contents** 

## CHAPTER 3 Technical Requirements and Instructions Division 32 Exterior Improvements

SECTION 32 12 17
Hot Mix Bituminous Pavement

## Ft. Campbell Requirements:

Section: Appendix DD

Corps of Engineers Guide Specifications shall be used and modified to reference "KDOT" for Asphalt pavement through out the installation except for Airfield pavements.

All new facilities should include waste handling equipment, concrete pads and screens as necessary. The designer should have some idea of the volume of waste to be generated by the final permanent facility. If the facility will generate recyclable materials, capacity for recyclable bins should be included.

## **Instructions to Designers:**

- 1. Design, contract drawings, and specifications paragraphs shall include each of the above features as they apply to the project.
- 2. Include any digging/excavation permits.

## **SECTION 32 13 11**

## **Concrete Pavement for Airfields and Other Heavy-Duty Pavements**

## Ft. Campbell Requirements:

Fort Campbell has experienced unsatisfactory life and performance in exterior concrete pavements due to alkali-silica reaction (ASR). ASR causes excessive expansion of concrete, leading to degraded load capacity, surface spalling, and eventual premature pavement failure. Secondary damage includes displacing adjoining vertical construction applying threatening lateral loads on adjacent embedded and pavement features.

Concrete for exterior pavements and hardstand areas shall specify and require only low alkali Portland Cement with Class F fly ash as the pozzolanic cement replacement and Ground Granulated Blast-Furnace (GGBF) Slag in combination for the concrete mix design test proportioning. Specific concrete mixture proportions have been developed for concrete pavement in an attempt to mitigate concrete expansion problems currently being experienced at the base.

## **Instructions to Designers:**

- 1. Design, contract drawings, and specifications paragraphs shall include each of the above features as they apply to the project.
- 2. Fort Campbell prefers that military vehicle and equipment parking/hardstand areas be concrete vice asphalt.
- 3. For new construction projects having concrete pavement for parking hardstand areas, roadways, airfield runways and aprons, one of the following Louisville District COE, Engineering Division technical elements -- ED-T, ED-TC and/or ED-TG -- shall be

consulted. These elements will provide specific design instructions and review all site related concrete specifications.

## **Return to Table of Contents**

## Section 32 16 13 Concrete Sidewalks and Curbs and Gutters

## Ft. Campbell Requirements:

Use of curbs and gutters is encouraged especially at road corners and radius. Use of parking blocks is not encouraged as this inhibits snow removal.

Handicapped curb ramps must meet ADA requirements.

Concrete for exterior pavements and hardstand areas shall use Class F fly ash as the pozzolanic cement replacement. Specific concrete mixture proportions have also been developed for these features in an attempt to mitigate concrete expansion problems currently being experienced at the base.

All new facilities shall include waste handling equipment, concrete pads and screens as necessary. The designer should have some idea of the volume of waste to be generated by the final permanent facility. If the facility will generate recyclable materials, capacity for recyclable bins should be included

## **Instructions to Designers:**

- 1. Design, contract drawings, and specifications shall include each of the above features as they apply to the project.
- 2. For MILCON projects, COE in-house units ED-TC and ED-TS shall be consulted for review of all site related concrete specifications.

## **Return to Table of Contents**

## Section 32 93 00 Exterior Plants

## Ft. Campbell Requirements:

(1) Maintenance during Planting Operation.

Maintain installed plants in a healthy growing condition. Begin maintenance operations immediately after each plant is installed and continue until the plant establishment period commences.

## (2) Plant Establishment Period.

On completion of the last day of the planting operation, the plant establishment period for maintaining installed plants in a healthy growing condition shall commence and shall be in effect for the remaining contract time period not to exceed 12 months. When the planting operation extends over more than one season or there is a variance to the planting times, the plant establishment periods shall be established for the work completed.

## (3) Maintenance during Establishment Period.

The maintenance of plants shall include straightening plants, tightening stakes and guying material, repairing tree wrap, protecting plant areas from erosion, maintaining erosion material, supplementing mulch, accomplishing wound dressing, removing dead or broken tip growth by pruning, maintaining edging of beds, checking for girdling of plants and maintaining plant labels, watering, weeding, removing and replacing unhealthy plants. If used, irrigation systems shall be for plant establishment only. Remove at the end of this period. Ft Campbell will not furnish potable water for irrigation.

## (4) Unhealthy Tree.

A tree shall be considered unhealthy or dead when the main leader has died back, or 25 percent of the crown is dead. Determine the cause for an unhealthy plant. Unhealthy or dead plants shall be removed immediately and shall be replaced as soon as seasonal conditions permit in accordance with the following warranty paragraph.

## (5) Warranty.

Furnished plant material shall be guaranteed to be in a vigorous growing condition for a period of 12 months regardless of the contract time period. A plant shall be replaced one time under this guarantee. Transplanting existing plants requires no guarantee.

Installation grounds keeping funding is limited. Maintenance free design around facilities and plant areas is required.

Ensure that the landscaping provided does not interfere with overhead power lines when it reaches maturity.

Fort Campbell maintains lists of suitable plant materials for use at the installation. These lists are subdivided into plant sizes. The following Ft. Campbell Landscape Plant Lists are in Appendix E.

Native Evergreens/Conifers
Native Deciduous
Introduced Evergreens
Introduced Deciduous

CHAPTER 3
Technical Requirements and Instructions
Division 33
Utilities

Section 33 11 00 Water Distribution

## Ft. Campbell Requirements:

Section: Appendix DD

The Fort Campbell water distribution was privatized in 2003. The owner of the system is now CH2MHill. All additions/alterations to the system must be done in accordance with the CH2MHill Design Manual. CH2M HILL's "Fort Campbell Water and Wastewater Design and Construction Standards" which is available on the Web. **You will need Adobe Acrobat Reader to open the standards as a .PDF file.** 

It is recommended you use an FTP program available from your system administrator or as shareware from many sites on the web such as Smart FTP or Cute FTP. (Typing "FTP" in Google will find dozens.)

URL: ftp://ftp.ch2m.com/fcpdesignstandards

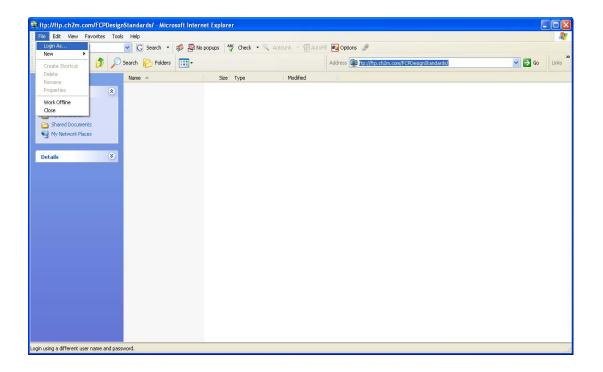
Username: fortcampbell

Password: fcpftp

Filename: FCP W+WW Design Guide and Const Standards Rev3 Feb07.pdf

Alternately, you can use Microsoft Internet Explorer as your FTP program. However, results are often slow & inconsistent. Directions below:

- 1. Enter the following in the Internet Explorer address bar: ftp.ch2m.com/fcpdesignstandards
  - 2. Hit return. An error message may appear. Just ignore it.
  - 3. Under the "View" pull-down menu, go to "Open FTP site in windows explorer". An FTP window will open on your computer.
  - 4. Go to the File→Login As...as shown below:



## **Return to Table of Contents**

## Section 33 30 00 Sanitary Sewers

## Ft. Campbell Requirements:

The Fort Campbell wastewater collection and treatment system was privatized in 2003. The owner of the system is now CH2MHill. All additions/alterations to the system must be done in accordance with the CH2MHill Design Manual. CH2M HILL's "Fort Campbell Water and Wastewater Design and Construction Standards" which is available on the Web. You will need Adobe Acrobat Reader to open the standards as a .PDF file.

It is recommended you use an FTP program available from your system administrator or as shareware from many sites on the web such as Smart FTP or CuteFTP. (Typing "FTP" in Google will find dozens.)

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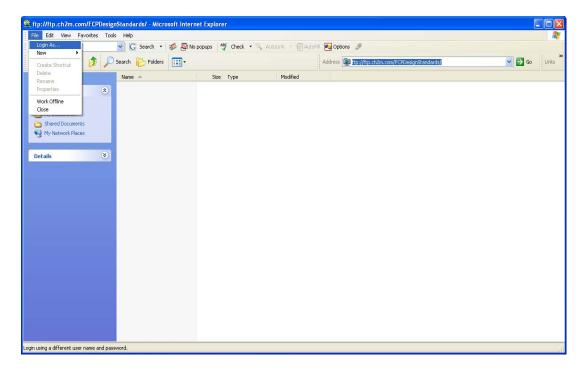
Username: fortcampbell

Password: fcpftp

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  - 4. Go to the File→Login As...as shown below:



## Section 33 40 00 Storm Drainage Utilities

## Ft. Campbell Requirements:

Verify capacity of existing infrastructure, and whether it is sized sufficiently to handle new construction.

Drainage of downspouts into storm sewer is encouraged in order to prevent erosion.

Include provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

Avoid use of odd pipe sizes (i.e. 3").

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible, utilities shall be pressure-pumped below roadways.

All utility lines installed underground shall be marked with magnetic tape.

Page 764 of 947

Include in contract requirements stating that the contractor is responsible for **IMMEDIATE** repair of existing project site utility lines broken during construction. Repairs shall be made to the satisfaction of the appropriate government entity.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

Additional Requirements are found in **Appendix A, Clean Water**.

## Instructions to Designers:

Section: Appendix DD

- 1. Point of Contact is Maintenance Chief at 270-798-5082 or 270-412-4804.
- 2. At the design meeting, obtain a current list of points of contact for utilities.
- 3. Design, contract drawings, and specifications shall be consistant with UFGS Section 33 40 00.

## **Return to Table of Contents**

## Section 33 51 15 Natural Gas/Liquid Petroleum Gas Distribution

## Ft. Campbell Requirements:

Gas lines shall not be used for electrical grounding.

Refer to Appendix F Utility Procedures for outside service lines

## Section 33 56 10 Factory-Fabricated Fuel Storage Tanks

This S.O.P. has incorporated the National Electrical Code (NEC), National Fire Protection Association (NFPA Code), Underwriters Laboratories (UL), and industry standards.

## 1.0 General:

- 1.1 All aboveground petroleum/fuel tanks, (ASTs) <u>shall conform</u> to all Federal, State, Local regulations and guidelines, and with these design requirements. This includes tanks for permanent placement as part of new construction, as replacement of existing storage systems, and tanks used for temporary storage by construction Contractors and military units.
- 1.2 All ASTs <u>shall</u> be double-walled type tanks. Means <u>shall</u> be provided to establish the integrity of the secondary containment. Secondary containment (a tank having an

inner and an outer wall with an interstitial space between the walls) provides a means for monitoring the interstitial space for a leak.

- 1.3 When there is a discrepancy between any or all of these guidelines, these requirements will be the final authority over all others except NFPA.
- 1.4 The Directorate of Public Works, Environmental Division, Petroleum Storage Tank Manager is the Installation Local Authority Having Jurisdiction (AHJ) who must approve any design proposal and construction before any installation of an AST.

## 2.0 Definitions:

**Fuel tank**: is any vessel containing more than 60 U.S. gallons of Class I or Class II flammable liquids.

**Emergency Vent**: An opening, construction method, or device that will automatically relieve excessive internal pressure due to an exposure fire.

**Normal Vent:** as a minimum size, all vents shall be at least 1-1/4 inches in inside diameter. It must have a bug proof, rain cap secured on top of the vent. The vent must be at least 3 feet higher than the highest point within a 10-foot radius of the ATS.

**Anti-siphon valve**: a device to prevent any siphoning due to damaged fuel lines, broken pumps, leaky or leaking fuel pumps. This device is not a check valve.

**Overfill protection device**: a device to serve as a catch basin to prevent any and all overfill spillage. Minimum size shall be 5 gallons.

**Fuel Level Gauge:** a device that is easily readable that automatically indicates the actual fuel level in the AST. A standard float type gauge is acceptable.

## 3.0 Location of AST:

- 3.1 All proposed installations sites of ASTs must have written prior approval by the AHJ.
- 3.2 Clearance distances:
- 3.2.1 No AST <u>shall</u> be installed closer than 5-feet from any type of an electrical disconnect device.
- 3.2.2 All ASTs between the size of 60 U.S. gallons and 2,000 U.S. gallons shall be located no closer than 10-feet from any building, lean-to, or property line.
- 3.2.3 All ASTs <u>shall</u> have at the minimum of 5 ft of unobstructed clearance on all sides to facilitate refueling, maintenance and serviceability.
- 3.2.4 No AST <u>shall</u> be installed without having at least a 15-foot aerial clearance from overhead or underground electrical lines, which includes but not limited to weather heads, transformers, and fuses.
- 3.2.5 The minimum distance between any two ASTs shall be 3-feet.

Page 766 of 947

3.2.6 The minimum distance between an AST with Gasoline or Diesel fuel and a LP tank shall be 20-feet.

3.3 All ASTs shall rest on the ground or on foundations made of concrete, masonry, piling, or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.

## 4.0 Aboveground Fuel Lines:

Section: Appendix DD

- 4.1 Below ground fuel lines shall not be permitted for use with an AST.
- 4.2 Aboveground supply and return lines.
- 4.2.1 Fuel lines <u>shall</u> be suspended a minimum of 6 inches off the ground and be supported every 3-feet with some type of approved support.
- 4.2.2 All AST fuel lines shall be protected against corrosion.
- 4.2.3 All ASTs <u>shall</u> have some type of protective features that prohibit any collision from motor vehicles, i.e., bollards.
- 4.2.4 All above ground fuel lines <u>shall</u> be insulated, heat traced, and protected with a covering equal to vinyl.
- 4.2.5 The fuel lines shall be separated by a minimum distances of 6 inches.
- 4.2.6 All AST aboveground fuel lines shall be of black carbon type steel.
- 4.2.7 All AST aboveground supply fuel lines <u>shall</u> have a shut off valve located as close as possible to the AST.
- 4.2.8 There shall be no traps or check valves in the return fuel line to the AST.
- 4.2.9 All pipe joints <u>shall</u> be of the threaded type, <u>no welding</u> of pipes or of the joints <u>shall</u> be permitted.
- 4.2.10 Joints <u>shall</u> be made liquid tight and <u>shall</u> be threaded, except that listed flexible connectors <u>shall</u> be permitted where installed with prior written approval of the Local Authority Having Jurisdiction.
- 4.2.11 All threaded joints <u>shall</u> be made up tight with a suitable thread sealant or lubricant. Joints in piping systems handling Class I liquids <u>shall</u> be welded when located in concealed spaces within buildings.

## 5.0 Normal Venting for aboveground Tanks:

5.1 Venting requirements shall be in accordance with current Unified Facilities Guide Specifications, Section 33 56 10, Factory Fabricated Fuel Storage Tanks. Stage I vapor recovery is the process of recovering vapors when a storage tank is filled. Stage I vapor recovery is mandatory on all Army Facilities. Stage II vapor recovery is the process of recovering vapors during vehicle fueling operations. Stage II vapor recovery is optional and will be included if required by state and local clean air regulations.

Section: Appendix DD Page 767 of 947

5.2 Prevent the development of vacuum or pressure sufficient to exceed the design pressure due to filling or emptying and the atmospheric temperature changes.

- 5.3 If any tank has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.
- 5.4 The outlet of all vents and vent drains on tanks equipped with venting to permit pressures exceeding 2.5 psig shall be arranged to discharge in such a way as to prevent localized overheating of, or flame impingement on, any part of the tank, in the event vapors from such vents are ignited.
- 5.5 Where vent pipe outlets for tanks storing Class I liquids are adjacent to building or public ways, they shall be located so that the vapors are released at a safe point outside of buildings and not less than 12 ft. above the adjacent ground level. In order to aid their dispersion vapors shall be discharged upward or horizontally away from closely adjacent walls. Vent outlets shall be located so eaves will not trap the flammable vapors or other obstructions and shall be at least 5 ft from building openings.

## 6.0 Emergency Venting for Fire Exposure for Aboveground Tanks.

- 6.1 Every aboveground tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure fires. This requirement shall also apply to each compartment of a compartmented tank, the interstitial space of a secondary containment type tank, and the enclosed space of tanks of closed top dike construction.
- 6.2 The outlet of all vents and vent drains on tanks, equipped with emergency venting to permit pressures exceeding 2.5 psig shall be arranged to discharge in such a way as to prevent localized overheating of or flame impingement on any part of the tank, in the event vapors from such vents are ignited.

## 7.0 Miscellaneous Requirements:

- 7.1 All ASTs permanently installed shall have a device(s) for fuel leak detection, fuel level, and all other monitoring requirements.
- 7.2 All ASTs shall be marked in accordance with N.F.P.A. 704.
- 7.3 All ASTs shall be grounded, and wired in accordance with NEC 70.
- 7.4 All ASTs shall have some type of spill containment that will hold 110% of the AST capacity.

- 7.5 All ASTs that have filling and emptying connections for any Class I or Class II, flammable liquids shall be closed and liquid tight when not in use and shall be properly identified.
- 7.6 All ASTs fill caps <u>shall</u> have an AHJ approved means of locking when not being refueled.
- 7.7 All ASTs <u>shall</u> have some device of fire fighting equipment in the immediate area. (Contact Fort Campbell Fire Prevention Section for further details).
- 7.8 Means <u>shall</u> be provided for determining the level of liquid in the tank. This means <u>shall</u> be accessible to the delivery operator.
- 7.9 Steps <u>shall</u> be installed as needed for providing access to tank components, i.e., fill port.
- 7.10 Precautions <u>shall</u> be taken to prevent the ignition of flammable vapors. Sources of ignition include, but are not limited to:
  - a. Open Flames
  - b. Lightning
  - c. Hot surfaces
  - d. Radiant heat
  - e. Smoking
  - f. Cutting and welding
  - g. Spontaneous ignition
  - h. Frictional heat or sparks
  - i. Static electricity
  - j. Electrical sparks
  - k. Stray currents
  - **I.** Ovens, furnaces, and heating equipment.

## **Return to Table of Contents**

## SECTION 33 61 00 Pre-Engineered Underground Heating/Cooling Distribution System

## Ft. Campbell Requirements:

Include spec provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is

properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration.

At design meetings, discuss notification schedule for outages. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

All utility lines installed underground shall be marked with magnetic tape.

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with DPW as soon as possible during the design process.

Utility lines are not to be abandoned in place. Remove abandoned lines.

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.

Ft. Campbell no longer requires dig permits. See <u>Appendix C</u> for procedure for marking underground utilities.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

## **Instructions to Designers:**

- 1. Point of Contact is Maintenance Supervisor at 270-412-4804.
- 3. Include Discussions of any digging /excavation being considered at the design meeting.
- 4. At the design meeting, obtain a current list of points of contact for utilities.
- 5. Design, contract drawings, and specifications shall include requirements of UFGS 33 61 00.

## **Return to Table of Contents**

## Section 33 70 02.00 10 Electrical Distribution System, Underground

## Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Directorate of Public Works Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall

be obtained at DPW, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

The distribution level voltage at Fort Campbell is 12.47/7.2 kV.

All new electrical distribution lines shall be installed underground. If and when overhead service has been approved by the installation, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

Minimize distribution lines installed under pavement.

Generally, when underground electric approaches 350-400 feet in length, provide a manhole.

Underground medium voltage lines shall be concrete encased. Underground service entrance conductors shall be copper installed in conduits. Copper conductors are preferred for overhead service drops, but aluminum conductors are acceptable. However provide copper conductors from meter base to service equipment inside. If meter or disconnect mounted on a pole, run copper conductors from transformer down.

Distribution lines shall be designed for maximum system flexibility. Use loop feed to create redundancy. In housing areas utilizing underground distribution, run separate feeds from transformer to each apartment.

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with DPW as soon as possible during the design process.

Utility lines installed underground shall be marked with magnetic tape.

Grounding shall not be accomplished at water lines. Use of ground rods is required.

Provide individual meters on gas, water, and electric service lines for all buildings. Meters shall be capable of receiving a device which will allow remote monitoring in the future.

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways. When underground utilities are sleeved under roadways, conduit sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect conductors from penetration by new road signs, poles, etc.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

## Section 33 71 01 Overhead Transmission and Distribution

## Ft. Campbell Requirements:

Section: Appendix DD

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Directorate of Public Works Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at DPW, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

The distribution level voltage at Fort Campbell is 12.47/7.2 kV.

All new electrical distribution lines shall be installed underground, see <u>Section 33 70 02.00 10 Electrical Distribution System</u>, Underground. If and when overhead service has been approved by the installation, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

Where distribution lines must be installed overhead:

- \* Use wooden poles with 20 year life span.
- \* Use armless, narrow profile construction where practicable.
- \* Use fiberglass cross arms where cross arms are required.
- \* Overhead lines shall be ACSR (no copper).
- \* All fittings shall be compression type.
- \* All equipment mounts shall be aluminum.
  - \* All overhead switches and cut-outs shall be of the load break type.

Minimize distribution lines installed under pavement.

Copper conductors are preferred for overhead service drops, but aluminum conductors are acceptable. However provide copper conductors from meter base to service equipment inside. If meter or disconnect mounted on a pole, run copper conductors from transformer down.

Distribution lines shall be designed for maximum system flexibility. Use loop feed where practicable to create redundancy. In housing areas utilizing underground distribution, run separate feeds from transformer to each apartment.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site. (See Section 01 50 00 for requirements of temporary electrical services).

- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.

Section: Appendix DD

- Rebuilt or reconditioned transformers will be not installed.
- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.
  - The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:

Model Number:

Serial Number

Manufacture Date:

KVA and Phase:

Primary Voltage:

Secondary Voltage:

Installation Date:

State Installed:

Location Installed:

Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the DPW Environmental Division should be contacted. The POC for PCB is Russ Godsave at (270) 798-9637.

## **Instructions to Designers:**

1. Include all required features and specific equipment features into project design and contract documents specifications as they apply.

## **Return to Table of Contents**

## Section 33 82 00 Telecommunications Outside Plant (OSP)

## Ft. Campbell Requirements:

See <u>Section 27 10 00 (Building Telecommunication Cabling System)</u> and <u>Appendix H</u> for further information on outside plant requirements.

# CHAPTER 3 Technical Requirements and Instructions Division 43 Process Gas and Liquid Handling, Purification, and Storage Equipment

Section 43 15 00.00 20 Low Pressure Compressed Air Piping (Non-Breathing Air Type)

## Ft. Campbell Requirements:

Preferences: Air compressor – Quincy.

## Appendix A

## **Environmental Requirements**

## <u>PARAGRAPH</u>

Δ-1

A-2	Clean Air Act
A-3	Clean Water Act
A-4	Safe Drinking Water Act
A-5	TSCA
A-6	FIFRA
A-7	Solid Waste Disposal Practices
A-8	Hazardous Waste Disposal Practices
Δ_9	Emergency Planning and Community Right-To-Know Act

A-10 National emission standards for hazardous air pollutants (NESHAP)

## A-1. Occupational Health Considerations

**Occupational Health Considerations** 

Ft. Campbell has design Standard Operating Procedures for the following items and they shall be used in preparation of a design:

## **Confined Spaces:**

Contractor shall observe OSHA Regulation 29 CFR Part 1910.146 regarding permitting, entry and working within confined spaces. Contractor is required to submit a work plan to the Contracting Officer's representative prior to entering any confined space.

## **Hazard Communication Program:**

Contractor shall observe OSHA Regulation 29 CFR Part 1910.1200 regarding a written hazard communication program for describing how requirements for labels and other forms of warning, material safety data sheets, and employee information and training will be met. The program will also include a list of the hazardous chemicals known to be present and the methods used to inform employees of the hazards of non-routine tasks.

## Lock Out, Tag Out Procedures:

Contractor shall observe OSHA Regulation 29 CFR Part 1910.147 regarding the control of hazardous energy (lock-out/tag-out).

Page 775 of 947

Lock-out/Tag-out for Safety: The Contractor shall use a locking device that secures a valve or lever in the "off" position when a repair, inspection, or construction or new installation is

Lock-out/Tag-out for Safety: The Contractor shall use a locking device that secures a valve or lever in the "off" position when a repair, inspection, or construction or new installation is required and also to clean or move any equipment. Making any exception to this rule could result in serious injury and death.

Lock-out: Blocking the flow of energy from the power source to the equipment - and keeping it blocked out - is called a lock-out system. A locking device is usually a key or combination lock arrangement.

Tag-out: Tag-out means placing a tag on the power source to warn co-workers or others not to turn the power on. The information on the tag shall include the name of personnel who put it there, the date, time the work begins, and type of work to be performed.

Basic Rules: Before shut down, the Contractor shall ensure that authorized employees know the type, magnitude, and hazards of the energy to be controlled; and shall verify the method or means of the system. He shall inform all affected employees of the lockout. The equipment shall be turned off, and the Contractor shall lockout energy sources and tag-out at the disconnect point. Any stored or residual energy may be released at that time so the equipment can be tested. The Contractor shall restore energy safely.

## **Return to Table of Contents**

## Return to Appendix A

## A-2 Clean Air Act:

Section: Appendix DD

A-2.1 Fort Campbell has specific Environmental points of contact, and requirements. These are available at the following Internet site: http://www.campbell.army.mil/envdiv/cleanairact.html

A-2.2 Ft. Campbell is a major source for criteria air pollutants and has an Operating permit for both Kentucky and Tennessee. Permitted air sources include boilers, spray booths, aggregate storage piles, etc. Air permit information is to be provided by designers to Ft. Campbell Environmental Division, Air Quality, prior to construction start. If required, construction and operating permits will be obtained by the Air Quality office. Construction permits are based on design while Operating permits are based on actual installation. Data needed for the permit application are on the **Control Device/Technique Checklist** and **Vent/Stack Checklist** that are included at the end of this Appendix for designers' use. If required, permits can take 3-6 months to obtain so as much of a lead time will be necessary.

A-2.3 Class 1 ozone depleting substances (CFC's, Halon) shall not be used on any project. Class 2 refrigerants (HCFC's) are close to being phased out of production so Class III refrigerants (HFC's) are preferred.

A-2.4 Emergency generator data must be obtained to determine compliance with new regulations. Please contact the Air Quality office if a new emergency generator is going to be installed.

W912QR-23413770 CERTIFIED FINAL-003 Page 776 of 947

A-2.5 Ft. Campbell has been designated as an "Attainment - Maintenance" area for ozone. A General Conformity Rule (GCR) analysis will be required for all projects that have the potential to impede the continuation of the attainment status for ozone and to ensure that the action does not hinder air pollution control efforts in the ozone "maintenance" area. The contractor performing the work on a project must provide information as requested on the **General Conformity Rule Checklist** included at the end of this Appendix and turned into the Air Quality office prior to commencement of construction.

A-2.6 Ft. Campbell Air Quality POC is Patty Lockard, 270.798.9603

Section: Appendix DD

## FORT CAMPBELL ENVIRONMENTAL DIVISION – AIR QUALITY PROGRAM VENT/STACK CHECKLIST

Organizational Owne	er/Operator:	Interviewer:	
Facility:	Contact:	Phone:	
Bldg. No.:	Room No.:		

Page 777 of 947

Description of emis	sion (particulate matter, gaseous, mi			
Identify source(s) so	erved			
Are criteria air pollu	stants emitted? (check one)	Yes No		
Are hazardous air p	ollutants emitted? (check one)	Yes	No 🗌	
	o have the potential for fugitive emisure of fugitive emissions in the com		Yes No	
	ack test for this source? (check one) of stack test documents to this form		No 🗌	
	rrogate stack test for this source? (or stack test documents to this form)		Yes No	
ick-up Duct Data (Not a	applicable if spray booth exhaust par	nel(s) are part of desig	an)	
Hood Type			•	
Hood Dimensions:	Slot Length			
	Slot Width			
	Distance from Hood Face to Contar	minant		
Hood F	ace Area (Calculated)			
	Measured Air Flow at Hood			
	Measured Face Velocity			
	Hood Static Pressure			
Duct IE	)			
	Duct Length to Bldg. Exit			
	Contaminant Capture Temp.			
ent Information				
Inside diameter (ID)	at exit( inche	s;	e)	
Vent height:	a. Above ground	(ft)		
<b>g</b>		(ft)		
		()		
Gas stream exhaus	t exit temp (	C - check o	ne)	
Exit velocity and standard condi	(ft/sec), at° F, (air tions (68 ° F and 1 atm)	pressure - note meas _(ft/sec)	urement units)	
Exit flow at exit con	ditions (ft <sup>3</sup> /min)			
Obtained from (che		test data		
•	d conditions (dscfi			
	,			
Stack gas moisture	percent at exit conditions%	By Weight	☐ Volume (check	one)

Section: Appendix DD

W912QR-23413770 CERTIFIED FINAL-003

Page 778 of 947

7.	Exit plume directio	n (check one):	Up	Down	Horizontal	
8.	Exhaust fan data:	Horsepower	RPM	Volume Rate _	(ft³/min)	
9.		ols installed? (check nd <u>attach</u> Control De		no 🗌 Checklist)		
	he stack/vent serves additional applicabl				d identify the units served	l. Complete
COM	IMENTS:					
						<u> </u>
						<u> </u>
						<u> </u>

Section: Appendix DD

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### General Conformity Rule Checklist General Information

Name of Project:	
Construction Company:	
POC Name:	
Phone Number/Email:	The second secon
Anticipated Start Date:	Anticipated End Date:

Section: Appendix DD

### **Construction Equipment Listing**

Equipment Type	Qty	Hours of Operation	Miles	Fuel Type
Bulldozer				
Grader				
Excavator				
Backhoe				
Dump Truck				
Fuel/Service Trucks				
Tractors				
Pug Mills (on site)				
Concrete Batch Plant (on site)				
Scraper				
Ready-Mix Truck				
Screed, Concrete	.00			2
Portable Paint Sprayer		75		
Air Compressor			18-112	
Lay Down Machines				
Rollers				
Compactors				2
Water Trucks				
Pavement Stripping Machines				
Traffic Road Striping				
Loaders				

AQGCRCKLST.1

Page 1 of 2 Issued: 5 September 2006

Revised: 20 March 2009

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Generators			
Compactors			
Curb and Gutter Pavers			
Other:			
Other:			3
Emergency G (This information will be needed for all stationary eme	enerator ergency gen necessary)	Information erators associated with the p	roject, attach a sheet if
Manufacturer:			
Model Number:	( <u>*</u>	2 11	
Horsepower:			
Max. Fuel consumption (gal/hr):			
Fuel Type:			
Serial number if currently available:			
Туре:	sheet if nece	essary)	
Manufacturer:			
Model Number:			
BTU Value:			
Fuel Type:			
Serial number if currently available:			
Personal Occupa	ncy Vehi	cle Information	
Vehicle Type	Qty	Miles driven on Post	Fuel Type
Light Duty Truck			
Heavy Duty Truck			
Car/SUV/Van			
Submitted by:		Date:	
	age 2 of 2 September	2006	Revised: 20 March 2009

ISSUE	STATEMENT TO BE INCLUDED
GENERAL CONFORMITY RULE (GCR)	OZONE: The current status for Fort Campbell is that the installation has been designated an ozone "maintenance" area in 2005. The maintenance plan requirements will be designed to maintain the average ozone concentration levels at or below the maximum allowed to sustain compliance with the National Ambient Air Quality Standards. The redesignation as an "attainment maintenance area" will be in effect for 12 years. During this time Fort Campbell Air Quality will have to establish that all construction activities will not impede the continuation of the attainment status and ensure the action does not impede Kentucky or Tennessee air pollution control efforts in ozone "attainment maintenance areas". This is referred to as the General Conformity Rule (GCR). The rule requires that an analysis and other procedures (if required as a result of the analysis) be completed prior to the commencement of any of the project activities. In order to make the determination, the Air Quality Program will need to gather information from the contractor concerning equipment types, hours of operation, number of personnel, etc. and then do calculations for estimated emissions. This process needs to be started as soon as the contractor is known, because it is required to be completed prior to groundbreaking. Once awarded, please have the contractor contact the Air Quality office at (270) 798-9598 or (270) 798-9603.  PM2.5: Nonattainment designations for particulate matter (PM) are based on 3- year averages of either each years' annual average concentration (annual average) or on a 24 hour average basis (a rolling 24 hour avg.). Exceeding either standard can result in an area being classified as nonattainment. Trends indicate that within the next few years Fort Campbell has a strong possibility of being designated nonattainment for
	PM2.5. If that should occur, PM2.5 will be considered and added to the GCR process as stated above.
Fuel Burning Equipment (Natural Gas and/or Fuel Oil)	Boilers ≥ 10 MBTU or any boiler that uses fuel oil, contact the Air Quality Program with specifications for boilers. Hot Water Heaters ≥ 120 gallons, contact the Air Quality Program with specifications for hot water heaters. The Air Quality Program will submit the Boiler NESHAP Notification to EPA.
Concrete/ Asphalt	Recommend that document include requirements concerning whether operations of concrete batch plant/asphalt plant (including any use of a pug mill) will be on or off post. If on post, need capacity and other design data to determine if air permits would be required and to determine other CAA related compliance issues. Approximately 120 day lead time to obtain state operating permit.
Debris Burning	Recommend inserting the statement "air pollution restrictions applicable to this project do not allow materials to be burned on the Government premises."
Debris Disposal	Recommend that document include requirements concerning disposal of debris. If the debris is to be sent to a grinder for recycling, need to know if the grinding equipment will be on or off post and if on-post, will need to obtain grinder capacity (tons/hour) and design in order to determine if air permitting and other CAA related compliance issues apply.  Approximately 120 day lead time to obtain state operating permit.
Dust	Recommend inserting the statement "maintain all excavations, stockpiles, access roads, waste areas, and all other work areas free from excess dust to such a reasonable degree as to avoid causing a hazard or nuisance".
Ozone Depleting Chemicals	Recommend inserting a statement requiring any refrigerants to have an ozone depleting potential (ODP) of 0.05 or less.

RetRetu rn to Table of

## **Contents**

## Return to Appendix A

## A-3 Clean Water Act:

- A-3.1 Ft. Campbell POC is Dan Etson at 270-798-9784.
- A-3.2 Ft. Campbell averages 3 million gallons per day. The high has been 13 million gallons. The desire is to not exceed this.
- A-3.3 Water volume calculations need to be submitted. There is a two to three month review time by State. Can walk permit through. Storm water shall not discharge into sanitary sewer.
- A-3.4 When sinkholes are encountered close them, and route water to natural storm drainage patterns. Must have permit from Tennessee to close sinkhole. Double sandbag or hay bales if sinkhole is part of the drainage pattern on a construction site.
- A-3.5 If water is discharged into Kentucky, then Kentucky permit will be required.
- A-3.6 If oil/water separators are used then design shall be the open top type. Ft. Campbell Environmental Division will provide oil/water separator design.
- A-3.7 Specifications and sizing data for construction of the grease interceptor are available to the design team. Designer will contact Gary Sewell for this information. State of Tennessee has sizing criteria. Grease interceptors shall be located for ease of access for cleaning by pumper truck.
- A-3.8 Pollution prevention plan must be maintained during construction. Notice-of-intent is required prior to moving any earth.
- A-3.9 See Specification <u>Section 01 57 20.00 10, Environment Protection</u>. Specifications must address spill containment for contractor and should contain language for servicing of construction vehicles. Five copies of Spill Contingency Plans shall be specified. The Contractor shall be required to mail or submit one copy of a Spill Contingency Plan to:

Wayne Lee Environmental Division, DPW Building 2186, 13-1/2 Street Ft. Campbell, KY 42223

And, four copies to the Contacting Officer. The Contractor shall not start work until the Spill Contingency Plan is approved by the Contracting Officer. If the contract does not require any plan for a specific project, he shall apply for an exception to the Contracting Officer with a copy to Mr. Lee, Environmental Division at address indicated above. For further information or guidelines in order to prepare Spill Plan contact Environmental Division, DPW at 270-798-9641.

Section: Appendix DD Page 783 of 947

- A-3.10 Dumping of any liquids on the ground will be considered a release.
- A-3.11 Floor drains are not to be provided except where required. They will be provided in a judicious manner, only where necessary. Old sewage system cannot take load. Shower drains are okay but wash-down drains are not acceptable. Mud Rooms must go to sanitary sewer. Discharge cannot adversely affect waste treatment. Biggest concern is volume. Ft. Campbell treatment facility almost maxed out. This is the reason shop wash down is not allowed. Must adhere to approved provisions for washing tents or vehicles. Washing must occur on grass areas.
- A-3.12 Must pretreat boiler blow down before discharge due to base sewer toxicity levels being a noted problem.

**Return to Chapter 2 Return to Storm-Drainage System** Return to Appendix A

## **Safe Drinking Water Act:**

- A-4.1 Dead end water lines shall not be installed. Lines must be looped and disinfected. POC is Audie Hardin at 270-956-1801.
- A-4.2 Backflow prevention is required on domestic water only and must be approved by state of Tennessee.

Return to Chapter 2 **Return to Appendix A** 

### **Toxic Substances Control Act (TSCA): A-5**

## A-5.1 Lead paint:

- A-5.1.1 Lead-based paint and lead containing paint protection required for working personnel in accordance with OSHA requirements. Lead exposure for air quality will be tested by an exposure assessment for the first building demolished; this data can then be used for the remainder of buildings. If test results indicate that airborne lead levels have not exceeded standards as established by the Clean Air Act, additional testing is not required.
- A-5.1.2 Lead-Based Paint Notification Requirements for Work in Family Housing:
- A-5.1.2.1 There is a new Federal requirement to notify family housing occupants when work in their quarters will disturb known or suspected lead-based paint (LBP). This requirement became effective 1 June 1999 and will affect all Army Family housing built prior to 1978. This final rule is issued under the authority of section 406(b) of the Toxic Substance Control Act (TSCA), 15 U.S.C. 2686(b) as amended by the Residential Lead-Based Paint Hazard Reduction Act of 1992 to add Title IV, entitled Lead Exposure Reduction. The Residential Lead-Based Paint Hazard Reduction Act is also referred to as Title X of the Housing and Community Development Act of 1992, Public Law 102-550. A copy of this requirement can be found in the Federal Register, 1 Jun 98, at http://www.epa.gov/fedrgstr/EPA-TOX/1998/June/Day-01/t14437.htm

A-5.1.2.2 The requirement is that whenever maintenance, repair, or renovation is performed in or on an occupied unit and LBP is disturbed (resulting in flaking or dust) that the worker (both in-house and contractor) must provide the occupant a copy of the pamphlet, "Protect Your Family from Lead in Your Home". The Pamphlet can be obtained at <a href="http://www.hud.gov/lea/leadhelp.html">http://www.hud.gov/lea/leadhelp.html</a>. This is the same pamphlet that is required to be given to occupants by the housing office when they are assigned to quarters containing leadbased paint (per ACSIM Memo, Subject: Disclosure Requirements for Lead-Based Paint Hazards in Army Family Housing, dated 24 Jul 96). The worker must also attempt to obtain from the occupant a written acknowledgment that the occupant has received the pamphlet (sample language on the above web site). These records must be kept for three years. This requirement also applies when work is done in common areas of occupied multi-unit family housing. The Garrison commander (or designated representative, such as the housing manager), as the owner's representative, must also be notified.

A-5.1.2.3 Contractors working in occupied AFH are also required to issue this pamphlet and this should be verified by the Government inspector. Current contracts should be modified as necessary to comply with this new requirement. Pre-1978 AFH units that are certified as free of lead-based paint and units that are vacant due to major renovation or between occupancy are exempt from this requirement. This requirement does not apply to minor repair and maintenance activities (including minor electrical work and plumbing) that disrupt 2 square feet or less of painted surface per component.

A-5.1.2.4 PAINTER-L is a computerized tool currently available to help manage the presence of LBP and LBP hazards. For more information on this system contact Dr. Ashok Kumar, CERL, at 1-800-USA-CERL.

**Return to Chapter 2** 

**Return to Appendix A** 

## A-5.2 Radon:

Section: Appendix DD

A-5.1.1 Building design must have Radon protection features. In the specifications, Contractor is to be required to test the building for radon after construction is complete. Radon mitigation design and testing: All construction performed at Fort Campbell must have passive radon mitigation features implemented into the design. The contractor will install preliminary features as per drawings. The contractor will hire an independent testing company to perform radon monitoring prior to habitation of the building(s). The testing firm must be EPA accredited and approved to perform work in the State of Tennessee (Kentucky). A list of accredited testing firms in the state of TN (KY) can be obtained through the state Radon Program Coordinator (TN 615-532-0733) (KY 502-564-4856). In the event radon concentrations greater than 4 pCi/l (pico curries per liter) are revealed, consult Fort Campbell DPW through the Contracting Officer's Representative for guidance pertaining to retesting. If upon further testing unacceptable levels are present, additional mitigation features will be installed followed by more testing. The buildings will not be inhabited until levels of less than 4 pCi/l have been achieved.

## Return to Chapter 2 Return to Appendix A

## A-6 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):

- A-6.1. Fort Campbell has an approved insecticide and pesticide list contained in the Installation Pest Management Plan (IPMP). The current IPMP's approved list of pesticides will be used in the preparation of the appropriate contract documents. All insecticide and pesticide work on Fort Campbell must comply with the IPMP.
- A-6.2. Contractors will submit a report of the pesticides used, type and amounts, on Ft Campbell to the FIFRA program manager. Applicators of pesticides on Ft. Campbell must be licensed in Kentucky and Tennessee.

Return to Chapter 2 Return to Appendix A

## A-7 Solid Waste Disposal/Diversion Practices:

- A-7.1 In the interest of reducing waste, Fort Campbell is actively recycling and reducing waste in all operations to meet the installation's 25 year sustainability goals. Contractors are required to participate in on-post programs. They are encouraged to find ways of reducing waste. Recycling shall be practiced to the maximum extent possible. Refuse materials shall be separated in accordance with installation policies and practices.
- A-7.2 Dumpster service is not provided by the installation. Contractors shall arrange for dumpster service at their own expense.

### A-7.3 Landfill:

- A-7.3.1 Contract specifications shall include contract performance requirements for a 50% minimum diversion of construction and demolition (C&D) waste by weight, from landfill disposal. Contract specifications will include submission of a contractor's C&D Waste Management Plan to be submitted and approved by DPW, preferably prior to the start of a site clearance.
- A-7.3.2 Point of contact for landfill issues is DPW Environmental Division at 270-798-9769.

### A-7.3.3 Landfill Access:

- Upon award of a contract the name of the contractor, the contract number, project name and the completion date of the contract is furnished to the Directorate of Public Works Environmental Division, which will in turn furnish landfill access passes for the contractor's use in delivering C&D debris materials to the Woodlawn Rd. C&D landfill.
- All loads of debris will be weighed and recorded in the landfill data base. Scales are available at the landfill. Each month, tabulation (by contract number) will be furnished to contracting office indicating the amount of debris generated by that contract, if requested.

Trucks and/or trailers shall be weighed coming in and going out of the landfill. The vehicle operator shall have a landfill access pass from the contractor to obtain entrance into the landfill. Other information that will be recorded includes whether the load contained asbestos or any other authorized special waste and whether the load contained recyclable materials.

## A-7.4 Materials Handling:

### A-7.4.1 Demolition and removal activities:

- Contract specifications shall require at least a 50% diversion (by weight) of C & D waste materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post. Construction specifications shall require a C & D Waste Management Plan to be submitted and approved by DPW.
- A-7.4.1 (a) Salvageable materials shall not to be transported off the installation. Government salvage requirements shall be evaluated on a project by project basis and salvage rights automatically apply for the following equipment:

Transformers
Cut-outs
Capacitors
Circuit Breakers
Voltage Regulators
Line hardware
Utility Poles

Salvageable metals that are recovered as a result of grinding shall be separated for sale as scrap metal.

- All salvageable materials removed from the project site shall be delivered to DRMO for selling as scrap metal. The Contractor must properly complete the turn in document, DD Form 1348-1a and ensure Fort Campbell funding code (21F3875 1111 76 C S15056 AC 9921) is utilized when materials are turned into DRMO.
- **A-7.4.1.** Non-salvageable materials shall not be removed from the installation. They shall be taken to the Woodlawn landfill or diverted for recycle/reuse as recovered materials. Transporting of non-salvageable materials off the installation must be approved by DPW Environmental Division, Pollution Prevention Branch (NO EXCEPTIONS).

Street surfacing (asphalt/concrete), sidewalks, steps and landing, curbs, gutters, chimneys, etc., and building related concrete and masonry materials shall be ground up at the project site and reused, to the maximum extent possible, on the construction site. When the quantity of ground concrete/masonry materials exceeds the amount that can be used on the project site, the excess shall be transported to a location designated by the COR and approved by the DPW Environmental Division, Pollution Prevention Branch. Materials to be

Section: Appendix DD Page 787 of 947

ground shall not be contaminated with other non-masonry/concrete/asphalt materials, such as doors, windows, piping, PVC items, toilet partitions, plumbing fixtures, excess dirt, etc. Reinforcing steel in the concrete is not considered a contaminant.

Whole pieces, no larger than 24" by 36" by 18", of concrete/masonry/asphalt materials generated at the project site may be transported to Woodlawn landfill if the total site quantity tons. These materials shall not be contaminated with other nondoes not exceeds masonry/concrete/asphalt materials, such as doors, windows, piping, PVC items, toilet partitions, plumbing fixtures, etc. Reinforcing metals/steel in the concrete is not considered a contaminant. The authority to use the Woodlawn landfill for disposal of concrete/masonry/asphalt material shall be specifically stated in the contract documents.

Bricks may be delivered to Woodlawn landfill whole or in pieces, in uncontaminated loads. and recycled to meet diversion requirements unless specified otherwise.

Land clearing waste (trees, stumps, tree branches, bushes, etc.) shall not be delivered to the Woodlawn landfill. This material shall be mulched on the project site and used as soil stabilization, mulch, etc. or transported to Bi County landfill for mulching. Logs cannot exceed a maximum length of 12 feet and diameter of 20 inches. This material can be credited to recycling if used as stated.

## A-7.4.2 New Construction Activities and Contracts:

• It is the contractor's responsibility to insure that all new construction C & D materials disposal meets the 50% diversion criteria. Waste recyclable materials, such as cardboard, paper, scrap metals, pallets, etc., shall be recycled and not landfilled. Evidence that this diversion criteria is met shall be maintained in a data log for the duration of the project by the contractor and provided to the project COR or the project engineer. Assistance in identifying recycler outlets can be obtained from DPW Environmental Division.

A-7.5 Construction projects requiring soil borrow material should be coordinated with DPW Engineering Division at 270-798-0972.

**Return to Chapter 2** Return to Appendix A

## A-8 Hazardous Waste Disposal Practices:

Section: Appendix DD

- A-8.1 Mercury containing light bulbs such as fluorescent tubes, mercury vapor, metallic halide, and high-pressure sodium lamps shall be considered has hazardous wastes and require special handling. Fluorescent, mercury vapor, metallic halide, and high pressure sodium light bulbs, while not a listed hazardous waste, may be a characteristic hazardous waste and therefore subject to testing and proper disposal as per RCRA. These lamps are a concern at Fort Campbell in regard to their disposal. Disposal of these materials resulting from demolition or other DPW related activities, shall be coordinated with the DPW Environmental Quality Officer for the policy contained in Section 11 of the EQP Handbook.
- A-8.2 Low-pressure sodium lamps are not listed hazardous wastes but require special handling.
- A-8.3 Refrigerant in air conditioning equipment being demolished must be recovered and transported to the Environmental Division Pollution Prevention Operations Center for reclaiming.
- A-8.4 PCB's is a concern for HVAC/Electrical and capacitors. Capacitors in existing air conditioning equipment may contain polychlorinated biphenyl's (PCB's).
- A-8.5 Fluorescent ballast in buildings to be demolished may contain PCB's.
- A-8.6 Transformers as well as all fluorescent ballasts and HVAC/Electrical capacitors to be removed may contain PCB's. Transformers shall be turned over to DRMO.
- A-8.7 Lighting ballast and capacitors are to be placed in 55-gallon drum and delivered to the Environmental Division Pollution Prevention Operations Center.

Return to Chapter 2 Return to Appendix A

## A-9 Emergency Planning and Community Right-To-Know Act (EPCRA):

A-9.1 Ft. Campbell is required by Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements", to comply with the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA requires Ft. Campbell to identify the amounts of chemicals present on, or released from its facilities, understand the potential problems that hazardous materials pose to the surrounding communities and environment, and provide information to the public and local emergency planning organizations. To comply with EPCRA requirements, Ft. Campbell must track and be accountable for hazardous materials (HM) used throughout the installation. The Contractor must submit information describing hazardous materials (paint, solvents, adhesives, treated lumber, etc) on FTCKY HAZMAT INVENTORY FORM to the Environmental Division Pollution Prevention Branch. The Contractor will account for the quantity of HM brought to the post, the quantity used or expended during the job, and the

leftover quantity to be removed from the installation. This information will be provided on a calendar year basis and must be submitted by the end of January following the year reported. Tracking of hazardous materials used by the Contractor shall be required by the contract.

Return to Chapter 2 Return to Appendix A

## CHECKLIST FOR NON-PROCESS SOURCE

Section: Appendix DD

Organizational O	wner/Operator:			
Date:		Interviewer:		
Facility:		Contact:		hone:
Bldg. No.:		Room No.:	Sc	ource No.:
	<del>-</del>	<u> </u>		· · · · · · · · · · · · · · · · · · ·
	•	FOR DPW-	E USE ONLY	
	☐ Required		equired	Market Committee
Permit Type:	☐ Operatin	g 🗆 Const	ruction   Relocat	ion
<u>General</u>		· · · · · · · · · · · · · · · · · · ·		
General				
1. Description ar	nd designation of	source (Boiler #1.	Hot Water Heater #1,	etc.)
<u> </u>				
2 Construction of	late (manufactur	ed)	Data commenced	amarations
Installation da	te (at site)		Date commenced	operations
3. Manufacturer				
Model No		Sei	rial No	
4 37 1				
<ol> <li>Normal operat</li> </ol>	ing hours	hrs/day,	days/week,	weeks/yr.
5. % operating (t	ime) by calendar	year per quarter		
1 0 \		3rd	4th.	
			<del></del>	
<ol><li>Maximum (pot</li></ol>				
	hrs/day,	days/week,	weeks/yr.	
7. Fuel type:	D <sub>r</sub> -	imani fual	Ctandha	£1 /:£>
BTU values of	fuels: Pri	imary fuel	Standby	fuel (if any) fuel (if any)
			Oundby	ruer (ii arry)
3. Primary use of	heat source			
Secondary use	of heat source (i	f any)		
) If! !				•
9. If coal burner,	type of firing? _			
0 Maximum rate	d boiler borseno	wer (BHP)		
Heat input care	acity (MANADay/be	.)		
Maximum rated	d electrical Outp	ut (kw)	(if applicable)	)
1. Average % load	d or	actual maximum he	eat input value used	MMBtu/hr
2 For finals other	than natural s	:::::::::::::::::::::::::::::::::::::		
2. For fuels other	man natural or l	iquified gases:		

1 of 2

## **CHECKLIST FOR NON-PROCESS SOURCE (continued)**

% Sulfur content			
% Ash	(if solid fossil fuel)		
13. Average annual fuel consumption:	Primary ( ft <sup>3</sup> [	□ gal - check one) □ gal - check one)	
14. Emissions monitoring equipment in	stalled?		
	(If yes, describe above)		
[ATTACH COMPLETED CO	NTROL DEVICE(S)/TECHNIQUE(	(S) CHECKLIST(S)]	
15. Is the source operated under a current operating or construction permit? ☐ Yes ☐ No (If <u>yes</u> , obtain copy of permit and <u>attach</u> to this checklist)			
16. If fuel oil is used, is the unit served by a fuel storage tank? (check one)  (If <u>yes</u> , <u>complete</u> and <u>attach</u> Storage Tank Checklist)  □ Yes □ No			
<ul><li>17. Is a fuel flow meter installed for</li><li>a. Natural gas (check one):</li><li>b. Other fuel (check one):</li></ul>	☐ Yes ☐ No ☐ Yes ☐ No		
[ATTACH COMPLETED STACK/	VENT CHECKLIST FOR NON-PE	ROCESS OPERATION]	
Comments			

**Return to Section** 

2of 2

#### VENT/STACK CHECKLIST

Da Fac Blo	te: cility: dg. No.:	tor: Interviewer: Contact: Address:	Initials: Phone: Permit No	D.:	
	neral				
1.	Description of emission	(particulate matter, gaseous,	mix, species name, etc.)		
2.					
3.	Are the emissions air co	ntaminants? (check one)		□Yes	□No
4.		e the potential for fugitive er f fugitive emissions in the co		□Yes	□ No
5.		st for this source? (check one ick test documents to this for		□ Yes	□ No
6.		te stack test for this source? (ack test documents to this for		□Yes	□ No
Pic	k-up Duct Data				
1.	Hood Type	<del></del>			
2.	Hood Dimensions Slot	Hood Face Area Measured Air Flow at H Measured Face Velocity Hood Static Pressure Duct ID Duct Length to Bldg. Ex	lood		
3.	Contaminant Data Name		tuency Portion easurement units)		

STACKVE.002 (Rev. 02/29/96)

Section: Appendix DD

1 of 2

Page 793 of 947

#### VENT/STACK CHECKLIST (continued)

Ver	t Information
1.	Inside diameter (ID) at exit (ft)
	Vent height: a. Above ground
3.	Gas stream exhaust exit temp (°F)
4.	Exit velocity(ft/sec), at°F,(air pressure - note measurement units) and standard conditions (68 °F and 1 atm)(ft/sec)
5.	Exit flow at exit conditions(ft <sup>3</sup> /min)  Obtained from (check one): = calculations = test data  Exit flow at standard conditions (dscfin)
б.	Stack gas moisture percent at exit conditions% = By Weight Grains Per Dry Standard Cubic Foot (gr/dscf)
7.	Exit plume direction (check one): = Up = Down = Horizontal
8.	Exhaust fan data: horsepower RPM volume rate (ft <sup>3</sup> /min)
9.	Air pollution controls installed? (check one) = yes = no (If yes, complete and attach Control Device/Technique Checklist)
10.	Is there a Bypass Stack? Y or N If so, describe and complete vent/stack form for the Bypass Stack.
11.	Is this stack equipped with continuous Pollutant Monitoring equipment? Y or N If yes, what Pollutants are monitored.
	ch drawing of emission source showing air contaminant flow from process to atmosphere.  splete the additional applicable process or non-process checklists.
Cor	uments

Section: Appendix DD

STACKYE NO (Rav. 00:29/Ng

2 of 2

## **Return to Section**

## A-10. National Emission Standards for Hazardous Air Pollutants (NESHAP)

Section: Appendix DD

Ft. Campbell has design Standard Operating Procedures for the NESHAP items and they shall be used in preparation of a design:

State of Kentucky and Tennessee NESHAP Reporting Requirements for Demolition (Defined as the demolition of a building or demolition of a load supporting structure such as a load-bearing wall) shall be followed:

- 1. In the case of demolition only, the contractor will mail and be postmarked, fax and followup with a mailing, or deliver the NESHAP notice 10 working days before demolition begins even if the operation involves removal of "non-regulated" ACM only in any amount, OR even if the operation involves no ACM removal whatsoever!
- 2. In the case of demolition where asbestos abatement is also involved, the contractor will send in a separate notice for the abatement as required in paragraphs 2.a. through 2.d. below. The abatement notice may also be included on the demolition notice, so that only one notice may be sent. In this case, include the additional notice lead times as identified in paragraphs 2.a. through 2.d.
- a. The Contractor is requested by the state to telephone at least 24 hours beforehand if the operation involves RACM that is below 260 LF, 160 SF, or 35 CF. This only applies in the contractor has sent a long-term NESHAP notification to the State.
- b. The Contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice 10 working days beforehand if the operation involves RACM that is below 260 LF, 160 SF, or 35 CF (and if the contractor has not sent a long-term NESHAP notification to the State).
- c. The Contractor is requested (not a regulatory requirement) by the State to mail, fax, deliver a notice, or phone in the notice so that it is received at least 24 hours beforehand if the operation involves non-regulated ACM in any amount. (In any case, the government "project designer" may still specify that the contractor does a NESHAP notice for any asbestos removal actions. This would be advantages to the government.)
- d. The Contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice at least 10 working days before abatement begins if the operation involves RACM that is at least 260 LF, 160 SF, or 35 CF.

#### 3. All Kentucky notifications are sent to:

Section: Appendix DD

Rebecca Bohannoh Kentucky Division for Air Quality Asbestos Branch, Paducah Region 4500 Clarks River Road Paducah, Kentucky 42003 (270) 898-8468 Office (270) 898-8640 Fax

All Tennessee notifications are sent to:

Mr. Randal Harrison Tennessee Division Air Pollution Control 9th Floor, L & C Annex, 401 Church St. Nashville, Tennessee 37243-1531 (615) 532-0554 Office (615) 532-0614 Fax

#### **Return to Appendix A**

## Return to Table of Contents APPENDIX B State Water/Sewer Submittals

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## **APPENDIX C**

#### **Digging / Excavation Permits**

This appendix establishes policies, procedures, and guidance for requesting utility locates associated with digging activities and excavation of soil to ensure protection of underground utilities (water/sewer, electric, gas, phone, steam/chill water, control cables, petroleum/POL, cable TV) and environmental/historical sensitive areas (archeological sites, former solid waste disposal sites).

Fort Campbell has stopped using dig permits. Tennessee One Call is being used to notify utility providers of the need to locate buried utilities prior to digging/excavation. One week prior to beginning digging/excavation, the contractor shall call 800-351-1111 with the following information:

a. Address

Section: Appendix DD

- b. Phone number
- c. Start date when digging/excavation to begin
- d. Start time time digging/excavation to begin
- e. Town Fort Campbell
- f. Dig Street & Number
- g. Nearest Intersecting Road

The proposed area of excavation shall be designated by the person responsible for the excavation by marking such area with safety white color coded stakes or white paint.

Section: Appendix DD Page 797 of 947

The underground utilities will be marked within 3 days as follows:

- a. Safety Red electric power distribution and transmission facilities
- b. High Visibility Safety Yellow gas and oil distribution and transmission facilities
- c. Safety Alert Orange telephone, telegraph, cable, television, video and other telecommunications facilities
- d. Safety Precaution Blue water system facilities
- e. Safety Green sewer system facilities
- f. Safety Purple reclaimed water, irrigation and slurry lines

If the start date and time arrives and one or more members have failed to mark the facilities. and there is clear evidence of the presence of an unmarked utility, you MUST call Tennessee One-Call with a Second Request.

If, during the course of excavation an underground facility has been damaged, notify the facility owner immediately of the location and nature of the damage. Do not try to repair the facility yourself or to cover up the damage.

A locate request has an expiration date. It is 15 calendar days from the date and time specified the dig is to begin.

The above information was taken from the "Tennessee Excavation Guide, April 2007" available from Tennessee One-Call System, Inc. (phone: 615-367-1110, email: tnocs@tnonecall.com

**Return to Table of Contents** 

## APPENDIX D Finishes, Exterior and Interior

The following are Ft. Campbell's standard color schedule for **Exterior Finishes** and special items:

STANDING SEAM METAL ROOF AND FASCIA

Manufacturer: Varies

Color: Butler, Kyner 500, color "Terra Brown" or approved equal

METAL SIDING (When approved)

Manufacturer: Varies

Color: Butler, Kyner 500, color "Country Wheat" or approved equal

EXTERIOR DOORS, FRAMES, TRIM AND ANODIZED ALUMINUM WINDOWS

Manufacturer: Varies

Color: Match standing seam metal roof color

BRICK

Manufacturer: Palmetto Brick Company

Color: ".75 Greystone"

Manufacturer: Acme Brick Color: "Ko-Ko Brown"

Manufacturer: Sioux City Brick Color: Beige Grey Velour

ACCENT BRICK

Manufacturer: Acme Brick Color: "Ko-Ko Plus Chocolate"

Manufacturer: Palmetto Brick Company

Color: "1.25 Greystone"

Manufacturer: Sioux City Brick Color: Charcoal Grey Velour

SPLIT-FACE CONCRETE MASONRY UNITS

Manufacturer: Southland Supply style

Color: Goldenrod, 24H

**MORTAR** 

Page 799 of 947

Manufacturer: Quickrete

Section: Appendix DD

Color: Ochre 2

Manufacturer: Holcim Cement

Color: PCL S Buff

ROOF FIXTURES
Manufacturer: Varies

Color: Match standing seam metal roof

DOWNSPOUTS, GUTTERS, LOUVERS, FLASHING

Manufacturer: Varies

Color: Match standing seam metal roof

**EXTERIOR SOFFITS AND CEILING** 

Manufacturer: Varies

Color: White (factory finish)

The following are Ft. Campbell's standard color schedule for **Interior Finishes** and special items:

Plastic Laminate, Vertical: Wilsonart, "1500N-60, Grey"

Wilsonart, "D432-60, Cashmere"

Plastic Laminate, Horizontal: Wilsonart "4640-60, Dove Moraine"

Wilsonart "4608-60, Caldera Beige"

Solid Surface Material: Wilsonart "1521-MG, Light Beige Mirage"

Wilsonart "D431-MG, Alabaster Mirage"

Vinyl Base: Azrock, 4" Vinyl Base, "CB-66"

Flexco, 4" Vinyl Base, "VCB-031 Zephyr"

VCT: Azrock, 12"xl2"x1/8" "V869, Tundra, Cortina Colors"

Azrock, 12"xl2"x1/8" "V787, Stratus"

Sheet Flooring: Tarket, "18319"

ACT: USG "2110, 2'x2'x5/8" White, Radar"

Page 800 of 947

ACT Grid: USG "Donn DX, 15/16", White"

Section: Appendix DD

Window Blinds: Valencia Deluxe, "0285, 1" Metal

Valencia Deluxe, "0023, 1" Metal

Carpet: Lees, 115 Mauve, Pebble Weave II

Lees, 305 Cloisonne, Pebble Weave II Lees, 204 Vienna Woods, Pebble Weave II

**Return to Finishes** 

**Return to Table of Contents** 

# **APPENDIX E**Fort Campbell Landscape Plant List

#### **Native Plant Material**

## (Native) Conifers/Evergreens:

Section: Appendix DD

Botanical Name	Common Name	
(Native) Tall Trees – (trees over 50 ft. at maturity)		
Pinus echinata	Shortleaf Pine	
Tsuga canadensis	Eastern Hemlock	
Taxodium distichum	Bald Cypress	
(Native) Medium Trees – (trees 25 to 50 ft. at maturity)		
Pinus virginiana	Virginia Pine	
Juniperus virginiana	Eastern Red Cedar	
(Native) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)		
Juniperus virginiana	Eastern Red Cedar	

## **Return to Exterior Planting Section**

## (Native) Deciduous:

Botanical Name	Common Name
(Native) Tall Trees- (trees over 50 ft. at maturity)	
Liriodendron tulipifera	Yellow or Tulip Poplar
Sassafras albidum	Sassafras
Liquidambar styraciflua	Sweetgum
Ulmus thomasii	Rock Elm
Celtis occidentalis	Hackberry
Celtis laevigata	Sugarberry
Morus rubra	Red Mulberry
Juglans nigra	Black Walnut
Carya illinoensis	Pecan
Carya cordiformis	Bitternut Hickory
Carya tomentosa	Mockernut Hickory
Carya ovata	Shagbark Hickory
Carya glabra	Pignut Hickory
Fagus grandifolia	American Beech

Botanical Name	Common Name
(Native) Tall Trees- (trees of	over 50 ft. at maturity) continued
Quercus alba	White Oak
Quercus stellata	Post Oak
Quercus bicolor	Swamp White Oak
Quercus michauxii	Swamp Chestnut Oak
Quercus prinus	Chestnut Oak
Quercus muehlenbergii	Chinkapin Oak
Quercus rubra	Northern Red Oak
Quercus palustris	Pin Oak
Quercus falcata	Southern Red Oak
Quercus velutina	Black Oak
Quercus shumardii	Shumard Oak
Quercus coccinia	Scarlet Oak
Quercus phellos	Willow Oak
Tilia americana	American Basswood
Populus deltoides	Eastern Cottonwood
Salix nigra	Black Willow
Diospyros virginiana	Common Persimmon
Prunus serotina	Black Cherry
Gleditsia tracanthos	Honeylocust
Gymnocladus dioica	Kentucky Coffeetree
Nyssa aquatica	Water Tupelo
Nyssa sylvatica	Black Tupelo
Aesculus octandra	Yellow Buckeye
Acer rubrum	Red Maple
Acer saccharinum	Silver Maple
Acer negundo	Box Elder
Fraxinus pennsylvanica	Green Ash
Fraxinus americana	White Ash
(Native) Medium Trees –	(trees 25 to 50 ft. at maturity)
Magnolia tripetala	Umbrella Magnolia
Magnolia macrophylla	Bigleaf Magnolia
Asimina triloba	Pawpaw
Ulmus alata	Winged Elm
Celtis occidentalis	Hackberry
Quercus stellata	Post Oak
Quercus marilandica	Blackjack Oak
Ostrya virginiana	Eastern Hop Hornbeam
Carpinus carolinia	American Hornbeam
Betula lenta	Sweet Birch
Betula nigra	River Birch
Salix nigra	Black Willow
Oxydendron arboreum	Sourwood
Diospyros virginiana	Common Persimmon
Halesia carolina	Carolina Silverbell

Botanical Name	Common Name	
(Native) Medium Trees – (trees 25 to 50 ft. at maturity) continued		
Amelanchier arborea	Downey Serviceberry	
llex opaca	American Holly	
Rhamnus caroliniana	Carolina Buckthorn	
Aesculus glabra	Ohio Buckeye	
Acer negundo	Box Elder	
(Native) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)		
Hamamelis virginiana	Witch Hazel	
Carpinus carolinia	American Hornbeam	
Kalmia latifolia	Mountain Laurel	
Prunus americana	American Plum	
Crataegus spp.	Hawthorn	
Cercis canadensis	Eastern Redbud	
Cornus florida	Flowering Dogwood	
Euonymus atropurpurens	Eastern Wahoo	
Cephalanthus occidentalis	Buttonbush	
Sambucus canadensis	American Elder	

## **Return to Exterior Planting Section**

## Introduced Species (Kentucky Extension Service List)

## (Introduced) Evergreen:

Botanical Name	Common Name	
(Introduced) Tall Trees- (trees over 50 ft. at maturity)		
Abies nordmanniana	Nordmann Fir	
Cedrus libani var. stenocoma	Hardy Cedar of Lebanon	
Picea abies	Norway Spruce	
Picea glauca 'Densata'	Black Hills Spruce	
Picea omorika	Serbian Spruce	
Picea orientalis	Oriental Spruce	
Picea pungens	Colorado Spruce	
Pinus densiflora	Japanese Red Pine	
Pinus flexilis	Limber Pine	
Pinus resinosa	Red Pine	
Pseudotsuga menziesii	Douglas Fir	
Thuja occidentalis	American Arborvitae	
(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity)		
Abies concolor	White Fir	
Chamaecyparis obtusa	Hinoki Cypress	
Chamaecyparis pisifera	Thread Cypress	
Ilex attenuata 'Fosteri'	Foster No. 2 Holly	
Juniperus chinensis	Chinese Juniper	
Osmanthus americanus	Devil Wood	

Botanical Name	Common Name
(Introduced) Medium Trees -	- (trees 25 to 50 ft. at maturity)
con	tinued
Pinus bungeana	Lacebark Pine
Pinus cembra	Swiss Stone Pine
Pinus densiflora 'Oculus-draconis'	Japanese Red Pine
Pinus strobus 'Fastigiata'	Columnar White Pine
Pinus strobus 'Pendula'	Weeping White Pine
Pinus sylvestris	Scotch Pine
Platycladus orientalis	Oriental Arborvitae
Taxus baccata	English Yew
Taxus cuspidata 'Capitata'	Upright Japanese Yew
	Shrubs – (10 to 25 ft. at maturity)
Abies koreana 'Prostrate Beauty'	Prostrate Korean Fir
Chamaecyparis obtusa 'Torulosa'	Contorted Hinoki Cypress
llex aquifolium	English Holly
Ilex crenata 'Noble's Upright'	Noble's Upright Japanese Holly
llex pedunculosa	Longstock Holly
Juniperus chinensis	Chinese Juniper
Juniperus scopulorum	Rocky Mountain Juniper
Picea glauca 'Conica'	Dwarf Albert Spruce
Pinus densiflora 'Umbraculifera'	Tanyosho Pine
Pinus mugo	Mugho Pine
Pinus strobus 'Contorta'	Curly White Pine
Pinus sylvestris 'Wateri'	Waterer's Scotch Pine
Rhododendron catawbiense	Rhododendron
Rhododendron azalea	Azalea
Rhododendron maximum	Rosebay Rhododendron
Sciadopitys verticillata	Umbrella Pine
Taxus cuspidata	Japanese Yew
Viburnum pragense	Fragrant Viburnum
(Introduced) Medium Shr	ubs – (6 to 8 ft. at maturity)
Chamaecyparis obtusa 'Sanderi'	Sanderi Hinoki False Cypress
Chamaecyparis pisifera	Sawara Cypress
llex meserveae	Blue Holly
Juniperus chinensis 'Sea Green'	Sea Green Chinese Juniper
Mahonia aquifolium	Oregon Holly Grape
Pieris japonica	Japanese Pieris
Taxus cuspidata	Japanese Yew
Taxus media	Spreading Yew
(Introduced) Small Shru	bs – (4 to 5 ft. at maturity)
Buxus microphylla	Boxwood
Chamaecyparis pisifera	Gold Thread Cypress
Ilex glabra 'Compacta'	Compact Inkberry
Ilex opaca 'Maryland Dwarf'	Maryland Dwarf American Holly
Juniperus chinensis	Chinese Juniper

Botanical Name	Common Name	
(Introduced) Small Shrubs – (4 to 5 ft. at maturity) continued		
Leucothoe fontanesiana	Drooping Leucothoe	
Mahonia aquifolium	Oregon Holly Grape	
Picea abies	Norway Spruce	
Picea pungens	Colorado Spruce	
Pinus mugo	Mugho Pine	
Pinus strobus 'Nana'	Dwarf White Pine	
Pinus sylvestris 'Beuvronensis'	Dwarf Scotch Pine	
Rhododendron 'Starry Night'	Starry Night Rhododendron	
Taxus baccata 'Repandens'	Spreading English Yew	
Tsuga canadensis 'Gentsch'	Gentsch White Canadian Hemlock	
(Introduced) Low Shrubs – (2 to 3 ft. at maturity)		
Abies balsamea 'Nana'	Dwarf Balsam Fir	
Chamaecyparis obtusa 'Pygmae	Dwarf Hinoki False Cypress	
Aurescens'		
Chamaecyparis pisifera	Moss Cypress	
Juniperus horizontalis	Compact Juniper	
Juniperus sabina	Savin Juniper	
Juniperus squamata 'Blue Star'	Blue Star Juniper	
Leucothoe fontanesiana	Drooping Leucothoe	
Mahonia aquifolium 'Compactum'	Compact Oregon Holly Grape	
Picea abies	Dwarf Norway Spruce	
Pieris japonica 'Pygmaea'	Pygmy Andromeda	
Pinus sylvestris 'Riverside Gem'	Riverside Gem Scotch Pine	
Rhododendron obrtusum	Azalea (several varities)	

## **Return to Exterior Planting Section**

## (Introduced) Deciduous:

Botanical Name	Common Name	
(Introduced) Tall Trees- (trees over 50 ft. at maturity)		
Acer platanoides	Norway Maple	
Alnus glutinosa	European Alder	
Cercidiphylium japonicum	Katusra Tree	
Eucommia ulmoides	Hardy Rubber Tree	
Fagus sylvatica	European Beech	
Ginkgo biloba	Ginkgo or Maidenhair Tree	
Larix kaempferi	Japanese Larch	
Metasequoia glyptostroboides	Dawn Redwood	
Platanus x acerfolia	London Planetree	
Quercus acutissima	Sawtooth Oak	
Quercus robur	English Oak	
Tilia cordata	European Linden	

Botanical Name	Common Name		
	s over 50 ft. at maturity) continued		
Tilia tomentosa	Silver Linden		
Ulmus parvifolia	Chinese Elm		
Ulmus x	Hybrid Elms		
Zelkova serrata	Japanese Zelkova		
	(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity)		
Acer campestre	Hedge Maple		
Acer griseum	Paperbark Maple		
Aesculus x carnea	Red Horsechestnut		
Aesculus pavia	Red Buckeye		
Amelanchier grandiflora	Apple Serviceberry		
Amelanchier laevis	Alleganey Serviceberry		
Betula populifolia	Gray Birch		
Betula maximowicziana	Monarch Birch		
Carpinus betulus	European Hornbeam		
Castanea mollissima	Chinese Chestnut		
Corylus colurna	Turkish Filbert		
Franklinia alatamaha	Franklin Tree		
Ilex decidua	Possum Haw		
Koeireuteria paniculata	Golden Raintree		
Larix decidua 'Pendula'	Weeping European Larch		
Maackia amurensis	Amur Maackia		
Magnolia virginiana	Sweet Bay Magnolia		
Phellodendron amurense	Cork Tree		
Prunus sargentii	Sargent Cherry		
Prunus sargentii Prunus serrulata 'Kwanzan'	Kwanzan Japanese Cherry		
Pyrus fauriei	Kwanzan Japanese Cherry  Korean Pear		
Stewarti pseudocamellia	Japanese Stewartia Pekin Lilac		
Syringa pekinensis			
Syringa reticulata	Japanese Tree Lilac		
Prunus x yedoensis	Yoshino Cherry		
Pyrus calleryana	Callery Pear		
, ,	e Shrubs – (10 to 25 ft. at maturity)		
Acer buergeranum	Trident Maple		
Acer ginnala	Amur Maple		
Acer japonicum	Fullmoon Maple		
Acer maximowiczianum	Nikko Maple		
Acer palmatum	Japanese Maple		
Acer tegmentosum	Manchu Striped Maple		
Aesculus parviflora	Bottlebrush Buckeye		
Buddlela alternifolia	Fountain buddiela		
Cercidiphyllum japonicum	Weeping Katsura Tree		
Chionanthus retusus	Chinese Fringe Tree		
Chionanthus virginicus	Fringe Tree		
Cornus alternifolia	Pagoda Dogwood		

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(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity) continued				
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Botanical Name	Common Name	
(Introduced) Small Trees/Large	Shrubs – (10 to 25 ft. at maturity)	
	tinued	
Viburnum opulus	Cranberry Bush Viburnum	
Viburnum plicatum var.	Doublefile Viburnum	
tomentosum'		
Viburnum prunifollum	Blackhaw	
Viburnum rhytidophylioides	Lantanaphyllum Viburnum	
Viburnum sargentii 'Onondaga'	Onondaga Viburnum	
Viburnum sieboldii 'Seneca'	Seneca Viburnum	
Viburnum setigerum	Tea Viburnum	
Viburnum 'Sesquehana'	Sesquehanna Viburnum	
(Introduced) Medium Shi	rubs – (6 to 8 ft. at maturity)	
Acanthopanax sieboldianus	Five-leaved Aralia	
Acer palmatum	Japanese Maple	
Aronia arbutifolia 'Brilliantissima'	Brilliant Red Chokeberry	
Berberis mentorensis	Mentor Barberry	
Berberis thunbergii	Japanese Barberry	
Buddleia davidii	Orange-eyed Butterfly Bush	
Clianthus florid us	Carolina Allspice	
Cercis chinensis	Chinese Redbud	
Chaenomeies speciosa	Flowering Quince	
Clethra ainifloia	Summer Sweet	
Cornus alba	Tatarian Dogwood	
Cornus baileyi	Bailey's Dogwood	
Cornus florida 'Pygmaea'	Pygmy Dogwood	
Cornus sericea 'Flaviramea'	Yellow-twig Dogwood	
Cotoneaster divaricata	Spreading Cotoneaster	
Deutzia lemoinei	Slender Deutzia	
Forsythia intermedia 'Sunrise'	Border Forsythia	
Hamamelis vernalis	Vernal Witchhazel	
Hibiscus syriacus	Rose of Sharon	
Hydrangea quercifolia	Oakleaf Hydrangea	
Ilex verticillata	Winterberry	
Kerria japonica	Japanese Kerria	
Ligustrum vulgare 'Lodense'	Lodense Privet	
Lonicera xyldosteum 'Claveyl'	Clavey's Honeysuckle	
Malus sargentii	Sargent Crabapple	
Morus alba 'Pendula'	Weeping Mulberry	
Myrica pensylvanica	Northern Bayberry	
Prunus x cistena	Purpleleaf Sand Cherry	
Pyracantha coccinea	Scarlet Firethorn	
Rhus aromatica	Fragrant Summac	
Ribes alpinum	Alpine Currant	
Spiraea nipponica 'Snowmound'	Snowmound Spirea	
Spiraea x vanhouttei	Vanhoutte Spirea	
Viburnum acerfolium	Mapleleaf Viburnum	
Viburnum carlesli	Koreanspice	
Viburnum juddii	Judd Viburnum	
	Tata Fibannani	

Botanical Name	Common Name		
(Introduced) Medium Shrubs -	(6 to 8 ft. at maturity) continued		
Viburnum x 'Mohawk'	Mohawk Viburnum		
Viburnum x pragense	Prague Viburnum		
Weigela florida	Weigela		
(Introduced) Small Shrubs – (4 to 5 ft. at maturity)			
Abelia grandiflora	Glossy Abelia		
Berberis thunbergii 'Aurea'	Golden Japanese Barberry		
Cotoneaster horizontalis	Rockspray Cotoneaster		
Deutzia gracilis	Slender Deutzia		
Divervilla sessilifolia	Southern Bush Honeysuckle		
Hydrangea arborescens	Hills-of-Snow		
Hypericum kalm	Kalm St. Johnswort		
Ilex verticillata	Winterberry		
Itea japonica 'Beppu'	Beppu Sweetspire		
Malus sargentii 'Tina'	Tina Crabapple		
Physocarpus opulifolius	Eastern Ninebark		
Potentilla fruticosa	Bush Cinquefoil		
Pyracantha coccinea	Scarlet Firethorn		
Syringa meyeri 'Palibin'	Meyer's Lilac		
Syringa patula 'Miss Kim'	Littleleaf Lilac		
Vibunum opulus 'Nana'	Dwarf Cranberrybush Viburnum		
Viburnum trilobum 'Compactum'	Compact American Cranberry Bush		
Viburnum utile 'Eskimo'	Eskimo Viburnum		
	s – (2 to 3 ft. at maturity)		
Berberis thunbergii	Japanese Barberry		
Caryopteris clandonensis 'Blue	Blue Mist Bluebeard		
Cornus sericea 'Kelseyi'	Kelsey's Dwarf Dogwood		
Cotoneaster apiculatus	Cranberry Cotoneaster		
Cotoneaster dammeri	Bearberry Cotoneaster		
Cotoneaster horizontalis 'Perpusilla'	Perpusilla Rock Cotoneaster		
Cotoneaster microphylla	Small Leaf Cotoneaster		
Forsythia viridissima 'Bronxensis'	Bronx Forsythia		
Forsythia 'Arnold's Dwarf'	Arnold's Dwarf Forsythia		
Fothergilla gardenii	Dwarf Fothergilla		
Hypericum 'Hidcote'	Hidcote St. Johnswort		
Jasminum nudiflorum	Winter Jasmine		
Kalmia cuseata 'White Wicky'	White Wicky Mountain Laurel		
Kerria japonica 'Picta'	Variegated Japanese Kerria		
Physocarpus opulifolius 'Nana'	Dwarf Eastern Ninebark		
Rhus aromatica 'Gro-low'	Gro-low Fragrant Summac		
Ribes alpinum 'Greenmound'	Greenmound Alpine Currant		
Rosa wichuriana	Memorial Rose		
Spiraea x bumalda	Bumald Spirea		
Spiraea japonica 'Little Princess'	Little Princess Japanese Spirea		
Symphoricarpos albus	Snowberry		
var. laevigatus			

**Return to Exterior Planting Section** 

**Return to Table of Contents** 

# Appendix F Utility Procedures

### **PARAGRAPH**

F-1	Introd	luction

- F-2 Record Drawings
- F-3 Metering
- F-4 Distribution Lines
- F-5 Existing Lines to be Removed
- F-6 New Service Lines
- F-7 Plans and Specifications
- F-8 Utility Cost Estimate
- F-9 Utility Company Contracts

**Return to Table of Contents** 

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The natural gas distribution system, the water distribution system for domestic and fire, and the sewer systems at Fort Campbell are now privately owned and operated by utility companies.

This is an outline of the recommended procedures for dealing with the utility aspects of facility design projects. Variation from this procedure is expected, depending upon the project. However, revised procedures should be agreed upon during the early design stages of a project. Unless noted otherwise in the design scope of work, the utility companies will install new service lines to buildings.

The utility companies are active players in the planning, design, and construction process of each building project.

Utility company contacts are provided below.

#### F-2 RECORD DRAWINGS:

The utility companies maintain as-built record utility drawings for the installation. To obtain utility drawings, refer to UTILITY COMPANY CONTACTS below.

#### F-3 METERING:

Metering of gas, steam, heating hot water, electricity, fuel oil, etc. is required by UFC 3-400-01 Energy Conservation.

Metering of water is required for all buildings where potable water demand is estimated to exceed 100,000 gallons per year.

Connection of the meters to the Energy Monitoring and Control System (EMCS) is required.

The gas utility company will install a regulator, an emergency gas connection, a seismic shutoff valve, and a meter with a pulse initiator for EMCS. A typical gas service meter assembly at the building is attached for information. Coordinate the location of this assembly with the utility company and show the location on the drawings and indicate that the installation is by the gas utility company.

Where required, a building domestic water meter will be provided inside the building mechanical room by the water company. Coordinate the location of this meter with the utility company and show the location on the drawings and indicate that the installation is by the water utility company.

The fire sprinkler water will not be metered.

#### F-4 DISTRIBUTION LINES:

The utility company will determine whether changes to the utility distribution systems will be required. The cost, schedule, and execution of the upgrade to the distribution system will be handled by Fort Campbell and the utility company as a contract action separate from the building project.

#### F-5 EXISTING LINES TO BE REMOVED:

Unused lines will be either removed or abandoned in place. If abandoned in place, the line will remain in GIS and be indicated as abandoned.

#### F-6 NEW SERVICE LINES:

The building designer determines the required capacity of each service line and the preferred location of the building service entrance.

The building designer determines the required gas pressure into the building (typically 14 inches water column).

The building designer obtains the installation utility record drawings (maps) from the utility company.

The building designer coordinates with the utility companies to determine and share the following information concerning the service lines:

- Flow
- Estimated consumption
- Line size
- Routing
- Tie-in points to the main distribution system
- Location of the utility service entrance to the building
- Location of the gas regulator / meter / emergency connection / seismic shutoff valve assembly
- Location of valves including the post indicator valve for the fire sprinkler system
- Location of the water meter
- The type of backflow preventer on the incoming domestic water service lines, usually a reduced pressure type
- The type of backflow preventer on the incoming fire sprinkler line, usually a double check type. However if there are additives such as antifreeze or foam in the system or if there is a second non-potable water source connected to the sprinkler system, a reduced pressure type is required.
- Location of existing utility lines to be removed

#### F-7 PLANS AND SPECIFICATIONS:

On the design drawings, the building designer shows:

- The routing of the new utility service lines, noted to be installed by others
- The location of building meters and regulator assemblies, noted to be installed by others
- The location of fire hydrants, noted to be installed by others
- The location of water line valves in the service lines, noted to be installed by others
- The location of post indicator valves, noted to be installed by others
- The location of utility lines to be removed, noted to be removed by others
- The main gas pressure

- The required building gas pressure
- The available static and residual water pressure and associated flow

Utility installation details are not shown.

Fire department connections are included in the contract as part of the sprinkler work.

The backflow preventers for domestic water and for fire sprinkler service are to be located inside the building and will be included in the building construction contract.

The building designer sends the design drawings to the utility companies. This should be done during concept design and during final design.

The utility company reviews the drawings and coordinates any required changes with the building designer.

The building designer includes a provision in the specifications that the building construction contractor must coordinate with the utility companies on the timing and sequence of work for the installation of the utilities. The utility contacts for utility work during construction below are to be included in the design documents.

The design documents must indicate that the utility company applies for all permits from the appropriate state authorities.

#### F-8 UTILITY COST ESTIMATE:

The building designer has no involvement in the gas and water utility cost estimate.

#### F-9 UTILITY COMPANY CONTACTS:

#### NATURAL GAS:

To obtain record drawings, to discuss gas service line capacity, size, routing, and tie-in points to the main distribution system and for coordination of gas utility work during construction or for inspection of contractor installed lines:

Clarksville Gas and Water Co.

Phone: 931-542-9600 Fax: 931-542-9601

#### WATER AND SEWER:

To obtain water and sewer record drawings, to discuss water and sewer service line capacity, size, routing, and tie-in points to the main distribution system, and for coordination of water and sewer utility work during construction or for inspection of contractor installed lines:

Chris Semler CH2M Hill Co.

Phone: 931-431-2015 Fax: 931-431-0952

**Return to Appendix B** 

**Return to Plumbing Section** 

**Return to Table of Contents** 

#### APPENDIX G

### Mold and Humidity Control

#### **PARAGRAPH**

G-1	Introduction
G-2	Building Envelope
G-3	Tight Buildings
G-4	Air Infiltration and Vapor Barriers
G-5	Gypsum Board and Wall Finishes
G-6	Attics
G-7	Crawl Spaces
G-8	System Selection / Space Humidity Considerations
G-9	Condensate Leaks
G-10	Barracks

#### **G-1 INTRODUCTION:**

Mold grows where mold spores, nutrients, correct temperature, and ample moisture are combined. Controlling moisture is the best approach to avoiding mold. Eliminating mold spores is impractical, the organic materials in buildings offer potential mold nutrients, and the temperature in buildings is conducive to mold growth. Thus minimizing moisture by eliminating leaks, drips, and condensation in the wrong places must be addressed. Undesired water and moisture usually comes from problems in either the building envelope or the building mechanical systems or both. Wet materials and surfaces are not always required for mold to grow. Even high humidity conditions contribute to mold growth. Air conditioning systems must be designed to keep space humidity at reasonable levels.

#### G-2 BUILDING ENVELOPE

The design of the building envelope must consider removal of all air entry points, cold bridges, multiple vapor barriers and gaps in the insulation system. Attics (with exceptions) and crawl spaces should no longer be ventilated. Interior floor slabs should be separated from foundations by insulated expansion joint materials. Cavity wall insulation should extend down to the footings. Insulated windows should be aligned with

cavity wall insulation to remove gaps in the insulation system. Window sills, foundation sills and other veneer wall features should be isolated from the structural backup wall allowing cavity wall insulation to run continuously. Use only thermally insulated windows. When designing with metal stud backup wall, apply minimum 1 inch rigid insulation over exterior sheathing to improve thermal performance. Consider the use of new insulation products such as Polyicynene which effectively eliminates air infiltration

#### **G-3 TIGHT BUILDINGS:**

and vapor transmission.

Section: Appendix DD

Leaks of unconditioned outdoor bring moisture into the building and lead to condensation on cold surfaces with subsequent wetting of building materials followed by deterioration of the materials and mold growth. Therefore, buildings that are relatively air tight must be the goal. A ventilated attic directly over an insulated lay-in ceiling, for example, does not represent tight building construction. Keep in mind that a slight pressure difference usually exists between inside and outside the building. Insulation batts alone will not stop air flow through the batt if a pressure difference exists from one side if the batt to the other and should therefore not be the only barrier to outdoor air. Mechanical air handling and exhaust systems are typically designed to bring in more air that they exhaust in an attempt to pressurize the building to prevent infiltration of outdoor air. This pressurization however is impossible if the building is full of holes. Pay close attention to the details of construction where walls meet roof to eliminate sources of air leaks. Note that building air tightness is not the same as vapor tightness. Buildings may be designed with or without vapor barriers depending on the indoor and outdoor conditions; however, air tightness must always be the goal.

#### G-4 AIR INFILTRATION AND VAPOR BARRIERS:

Recent studies have shown that air infiltration/exfiltration is a more significant source of moisture accumulation in walls than water vapor diffusion. Air infiltration barriers (such as Tyvek) resist entry of air in walls that can transport moisture and create condensation problems while allowing water vapor to escape. These barriers also resist wind blown rain and water while protecting wall sheathing.

The use of vapor barriers, vapor retarders, and perm ratings for construction materials in the building envelope must be carefully considered for use by the designer. Vinyl wall coverings, bituminous damproofing, certain paint systems all have properties which may create vapor retarders. If used, vapor barriers must be placed at a location where the temperature is above the dew point temperature in both the heating and the cooling seasons. It is critical to eliminate multiple vapor retarders in wall systems which can trap moisture and create potential mold conditions.

#### G-5 GYPSUM BOARD AND WALL FINISHES:

Do not place paper covered gypsum board or other surfaces that may provide nutrients for mold behind wall mounted fan coil units. Condensate drips from the valves and cold piping inside the fan coil cabinet and a small splash occurs with each drip. Because manufacturers provide no rear panel to the fan coil cabinet, the splashed droplets dampen the wall surface behind the fan coil unit. Conventional gypsum board material at this location insures mold growth. Provide a wall liner made of plastic, metal, or other material that will not be a nutrient source for mold behind wall mounted fan coil units.

Do not use vinyl wall coverings on the interior surfaces of exterior walls or wall surfaces opposite kitchens or shower rooms. Moisture from these high humidity spaces will be trapped and condense behind the vinyl. Use of vinyl wall covering is not permitted in locations with predominant air conditioning loads rather than heating loads.

#### G-6 ATTICS:

Because mold is becoming more associated with the entry of moisture laden air in the building envelop, it is strongly recommended that ventilated attics be used only in limited applications. However, if an attic is ventilated, do not use a vapor barrier under the insulation installed on top of the ceiling. This is because in the cooling season, this puts the vapor barrier in a location made cold by air discharging from supply air diffusers.

#### **Return to Appendix G**

#### G-7 CRAWL SPACES:

Do not ventilate crawl spaces. Doing so introduces moisture to the crawl space which will migrate through floors and condense on the underside of floor coverings. The moisture can also condense on cold pipe surfaces within the crawl space; even the outer surface of the insulation on a chilled water line can easily reach temperatures below the dew point of a ventilated crawl space.

Use a 10 mil vapor barrier on the ground surface to prevent moisture migration from the ground. Cover the vapor barrier with gravel.

#### G-8 SYSTEM SELECTION / SPACE HUMIDITY CONSIDERATIONS:

Direct humidity control using reheat is rarely necessary except in the most demanding climate control situations such as libraries or museums. Indirect humidity control can reasonably be achieved through thoughtful system design.

The paragraphs below are not meant to dictate equipment or system types. Rather, the goal is to point out the advantages and disadvantages of various systems with regard to space humidity for designer consideration.

Most systems are designed to do a good job of limiting humidity at full cooling load. The problem with high space humidity usually occurs at part load.

Oversized equipment essentially runs at part load all the time, so over sizing must be avoided.

Make sure the occupant's needs for temperature and humidity are known.

Design systems to limit space relative humidity to 45% instead of the usual 50% at full load. Use an indoor design condition of 78 deg F / 45% RH.

Design systems to limit space relative humidity to 60% at part load conditions.

Size cooling coils handling outdoor air for the design dry bulb temperature day, or the design humidity day which ever gives the greater coil capacity.

#### Single Zone Systems:

These systems modulate the supply air temperature in response to the space temperature.

Avoid adding safety factor to the cooling loads. Doing so increases the supply airflow, and with excess airflow comes high supply air temperature which leads to high space humidity.

A typical single zone air handling system serving a small office area is an example. Assess the cooling loads carefully and do not arbitrarily increase airflow or oversize the equipment.

Simple single zone systems serving a theater, an auditorium, or a gymnasium can be a problem, particularly if one air handler is used for the entire area. The wide fluctuation in load caused by the wide variation in the occupancy of these facilities leads to problems at part load conditions. In many cases, a single air handling unit sized for full occupancy can maintain space temperature setpoint with a supply air temperature that is within a degree or two of the space temperature when the facility is at minimal occupancy. This insures part load humidity problems.

Get the airflow right and full load humidity problems are less likely. Always consider what will happen to the supply air temperature and the resulting space humidity at part load conditions. Consider the following possible solutions to part load humidity problems when using single zone equipment:

Colder Supply Air – Design for colder supply air. Then at part load the air will be colder than it would otherwise be, more moisture will be removed from the air stream, space humidity at part load will be lower. (Designing for lower space relative humidity will require colder supply air.)

Variable Air Volume Single Zone System – The single zone cooling coil provides constant discharge air temperature while the fan speed is modulated based on space temperature. After the fan reaches minimum speed the supply air temperature is modulated by decreasing.

Return Air Bypass Single Zone System – Using face and bypass dampers, bypass return air (not mixed air) around the cooling coil as the space cooling load is satisfied while the cooling coil operates with full flow.

Multiple Single Zone Systems – Use more than one air handling system. As the cooling load falls shut down one or more units. This causes the remaining units to supply colder air to maintain the space temperature setpoint.

#### Multizone Systems:

As with single zone, accurate determination of the cooling loads and zone airflow leads to good humidity control at full load conditions.

During warm weather, many multizone systems are operated without heating water to the heating coil because the boiler is turned off. Then at part load, mixed air is essentially bypassed around the cooling coil through the hot deck. The moisture laden mixed air is then delivered to the space causing a rise in the space humidity.

Improved part load performance space humidity performance can be achieved by resetting the hot deck temperature upward during periods of high humidity. (Of course this requires operating the boiler during the warm weather months.)

A Texas multizone with individual heating coils in the individual zone ducts also offers a possible solution to the part load humidity problem by providing a means of reheat.

Carefully consider the part load space humidity before using a multizone system.

#### **Dual Duct Systems:**

These systems typically have a hot and a cold deck and are similar to multizone systems. Instead of zone dampers, modulating dual duct mixing boxes mounted near the space combine the hot and cold air streams from separate ducts then deliver the mixture to the space. The part load humidity problems are the same as with a multizone.

Improved part load space humidity performance can be achieved by resetting the hot deck temperature upward during periods of high humidity. Of course this requires operating the boiler during the warm weather months.

A modified arrangement known as a Dew Point Dual Duct system could be employed for good humidity control. All of the mixed air in the air handler passes through the cooling coil. Then a portion of this air is split off and passes through the hot coil then to the hot duct. Both hot and cold air streams have the same low dew point temperature giving this arrangement its name.

Carefully consider the part load space humidity before using a dual duct system. The system may be more expensive than other alternatives due to the requirement for two supply main ducts. As with a variable air volume system, terminal boxes are required, and these create additional maintenance.

#### Variable Air Volume Systems:

Because a VAV air handler maintains cold discharge air, it automatically maintains reasonable space humidity and should be considered where applicable and when budget permits.

However, VAV systems are not a panacea. The valve, heating coil, controls, and often filter and fan inside every VAV box represent additional maintenance. The maintenance aggravation is amplified when the VAV boxes are not easily accessible.

#### Computer Room Units:

Oversized computer room units are common. Determining the cooling load by summing all the nameplate amp ratings of all the computer equipment will surely result in an oversized unit and cause inefficient operation. Space humidity may not be a problem only because the computer room unit has reheat capability. The unit adds enough heat to make up for the excess in airflow. Size computer room units to accommodate the estimated heat release from the computer equipment; airflows will be decreased, the supply temperatures will be lower for a longer period of time, and the reheat will operate far less frequently. Always consider multiple computer room units to split the cooling load.

#### Fan Coil Systems:

Fan coils usually handle sensible loads but often fall short on the latent load.

Do not design fan coil units to handle outdoor air because the cooling coils are usually not deep enough, because cycling the coil flow insures periods when no moisture removal occurs, and because local exhaust systems can cause bypass of outdoor air around the cooling coil directly into the space.

In lieu of specifying the total coil load for fan coil units, specify the entering and leaving air conditions, and specify that these conditions must be met at all fan

speeds. Where multi-speed fan coil units are used, schedule the maximum airflow at the high fan speed setting.

Fan coil units represent a great maintenance burden. The multiple cooling coils with multiple filters, multiple condensate pans, multiple potential leak sources, and multiple potential locations for mold growth must be considered.

Fan coils shall be installed in a manner that will prevent water from dripping or splashing outside the drain pans. Require back splash panels to contain the splashing cause by drips from coil valves and uninsulated piping within the cabinet enclosure.

#### Direct Expansion (DX) Equipment

Avoid the use of DX coils in air handlers with constant running fans that handle outdoor air. When the sensible load is satisfied and the compressor turns off, unconditioned outdoor air is then delivered to the space and any water on the wet cooling coil is evaporated into the supply air and also delivered to the space. The result is poor part load humidity control.

#### **G-9 CONDENSATE LEAKS:**

Condensate drain pans and drain lines from air conditioning equipment must be designed to allow access for cleaning and flushing. Blockages in fan coil condensate lines are notorious for causing overflowing drain pans and wet floors, walls, and ceilings.

Improper trapping of condensate discharge in air handling units leads to water hold-up and overflow at the condensate drain pain.

Provide details of the condensate traps on the design drawings. Require adequate slope in two directions on condensate drain pans and drain lines (1/4 inch per foot). Make certain that the equipment curb or equipment frame affords ample elevation of the pan outlet connection above the floor or roof to accommodate the required trap dimensions and drain line slope.

#### Return to Appendix G

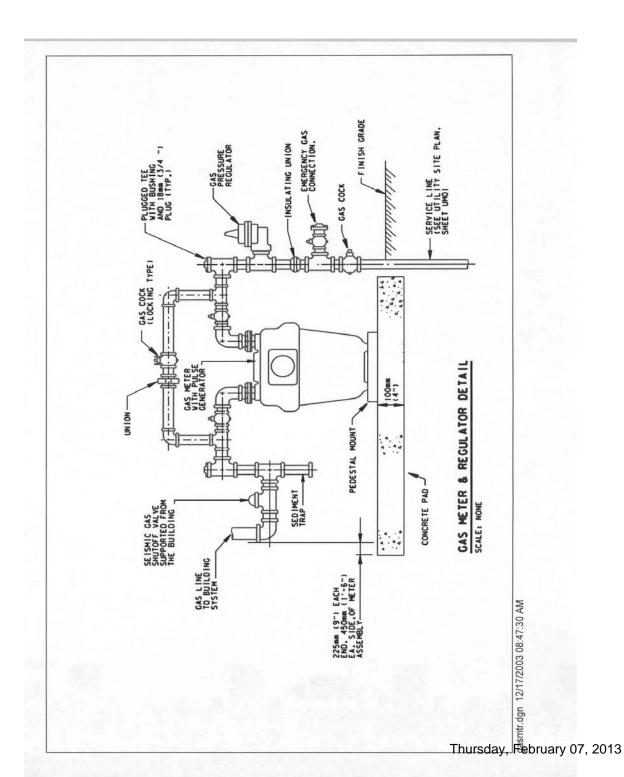
#### **G-10 BARRACKS:**

Barracks have historically had high humidity problems leading to mold growth in the living space.

In barracks, follow the design found in TI 800-01 Appendix B Unaccompanied Personnel Housing for the mechanical systems in barracks. This guidance requires that

outside air be treated (heated / cooled) by a separate dedicated air handling unit to a neutral temperature, or as necessary to handle the latent load, and ducted to each living / sleeping room (Dedicated Outside Air System, DOAS).

#### **Return to Table of Contents**



## **APPENDIX H**

Network Enterprise Center Fort Campbell, KY Requirements

> Prepared By: N.E.C. 907 Bastogne Ave Fort Campbell, KY 42223

> > Revised 1 Jan 2011

NEC-SFB-DS

01 JAN 11

Section: Appendix DD

MEMORANDUM FOR Directorate of Contracting

SUBJECT: Fort Campbell Information Technology (IT) Technical Design Guide

- 1. Purpose. To outline the associated reference documents and identify local enhancements/ clarification for all IT-related construction services provided on Fort Campbell, Kentucky. Based on varying environmental, infrastructure density and construction considerations unique to Fort Campbell, the NEC has identified the need to implement certain deviations from the references listed below as they pertain to IT construction efforts on the installation. These deviations are found at the enclosure and are listed by reference. Each deviation consists of: the Item Paragraph Number, Item Name, and verbiage as it appear in the reference; the deviation imposed by the NEC; followed by a justification for implementing that specific deviation.
- 2. References. Below are the IT regulations/standards used by the Fort Campbell NEC to ensure compliance for all unclassified (NIPRnet) and classified (SIPRnet) and IT-related voice and data equipment/services and associated construction efforts:
- a. "Technical Guide for Installation Information Infrastructure Architecture (I3A), Department of the Army, U.S. Army Information Systems Engineering Command, Fort Huachuca, AZ", dtd February 2010.
- b. "Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNET), Version 5.0", dtd February 2010.
- c. National Security Telecommunications and Information Systems Security (NSTISSI) No. 7003, "Protective Distribution Systems (PDS)", dtd 13 December 1996.
- d. NSTISSAM TEMPEST/2-95, "Red/Black Installation Guidance", dtd 12 December 1995.
  - e. NSTISSAM TEMPEST/2-95A, Amendment to Tempest 2/95, 03 February 2000.
- f. Army Regulation 380-5, "Department of the Army Information Security Program", Chapter 7, Section III, dtd 29 September 2000.
- 3. Applicability: This policy applies to all persons who provide IT construction services to any facility located on Fort Campbell, Kentucky. NEC-SFB-DS

SUBJECT: Fort Campbell Information Technology (IT) Technical Design Guide

W912QR-23413770 CERTIFIED FINAL-003 Page 825 of 947

Section: Appendix DD

4. This memorandum supersedes "Information Technology (IT) Technical Design Guide, dtd 05 January 2010.

5. Point of contact for this document is the, NEC Plans/Architecture Branch located at 907 Bastogne Ave., Fort Campbell, KY 42223, 270/798-6238.

Encl

// Original Signed//
TIMOTHY E. EAYRE
Deputy Director, Network Enterprise Center
Fort Campbell, KY

#### TABLE OF CONTENTS

Tech Guide for Installation Information Infrastructure Architecture (I3A), dtd FEB 10

Item: 2.3.1 Outlet Box Item: 2.3.5 **Outlet Types and Density** Item: 2.3.5.1 Family Housing Units Item: 2.3.5.2 Quarters Item: 2.3.5.3 Systems Furniture Wiring Item: 2.3.5.4 Wireless Access Point (WAP) Cabling Item: 2.4.1.1 Copper, Voice and Data Item: 2.4.2.2 Copper Termination Item: 2.4.4.7 Small Facilities and Renovations Room Door Item: 2.5.4 Item: 2.5.10 Fiber Optic Patch Panels (FOPP) Item: 2.5.15 Electrical Power Item: 3.3.2.1 Copper Item: 3.5.2 **Utility Location** Item: 3.5.9.2 Grass Item: 3.6.3 **Direct Buried** Item: 3.6.4 Aerial Item: 3.7.1.3(b) Accessories (locking covers) Item: 3.7.1.5 Stenciling (Maintenance Holes) Item: 3.7.2 Hand holes Item: 3.7.2.2 Stencil (MH) Minimum Duct Bank Sizing Item: 3.7.4.5(e) Item: 3.8.4.6(a) **Duct Installation Guidelines** Item: 3.8.3 Warning Signs Item: 3.8.4 **Plowing** Item: 3.8.5 Trenching Item: 3.8.5.1 Backhoe Trenching Item: 3.8.5.2 Trencher Trenching Item: 3.8.6 Depth of Placement Item: 3.8.6.1 Copper Cable Item: 3.8.6.2 FOC Item: 3.8.6.3 Frost Considerations Item: 3.8.6.4 Other Considerations Item: 3.8.7 **DB** Cable Splicing Item: 3.11 Free Space Optics Item: 3.15.2 Cable ID/Cable Tags Item: 3.15.3.3 **Splices** Item: 3.17.3.1 Fiber Termination Device Item: 3.17.3.2 Fiber Terminations

Army Reg 380-5, "Dept of the Army Information Security	
Program", dtd 29 Sep 2000	
Item: 7-3 Standards for Storage Equipment	20
Tech Guide for the Integration of Secure Internet Protocol	
Router Network (SIPRNET), Ver 5.0, dtd Aug 2008	20
National Security Telecommunications and Information	
Systems Security (NSTISSI) No. 7003, "Protective Distribution	
Systems (PDS)", dtd 13 December 1996	20
NSTISSI TEMPEST/2-95, "Red/Black Installation Guidance",	
dtd 12 December 1995	21
Figure A, Equipment Rack	22
Figure B, Manhole	23
Figure C, Steel Cage	. 24

## Clarifications/Enhancements

"Technical Guide for Installation Information Infrastructure Architecture (I3A),
Department of the Army, U.S. Army Information Systems Engineering Command, Fort
Huachuca, AZ", dtd FEB 2010.

## ITEM: 2.3.1 - Outlet Box

Specify double gang electrical boxes of at least 2-1/8 inches (in) (54 millimeters (mm) depth to provide dedicated space for current and possible future FO cable (FOC) installation. For single connector outlets, such as voice-only, cable television (community antenna television (CATV)) or closed circuit television (CCTV), use a single gang 2 in by 4 in by 2-1/4 in (51 mm x 102 mm x 57 mm), electrical box recess mounted, with the faceplate flush with the wall surface. Locate a service power outlet within 6 inches (152 millimeters (mm) of the CATV or CCTV outlet. Designers should specify 4-11/16-in (119 mm) square by 2-1/4 (57 mm) boxes for 1-in (27 mm) conduit installations and outlet boxes that have or may require FO cabling.

CLARIFICATION/ENHANCEMENT: Dual jacks will be used instead of a single jack use. Dual jack will be one voice and one data. NO single jacks will be installed without NEC approval in writing.

JUSTIFICATION: All jacks will contain a voice and data, cat 6, so that each desk location will have both. If an office needs more data than voice, jack usage can be adjusted at minimal cost.

## ITEM: 2.3.5 - Outlet Types and Density

Table 1 shows outlet types that are commonly used in military construction projects. Sketches of these outlets are included in Figure B-6 of Appendix B. The outlet types do not cover all possible user required configurations. The designer must certify that all user-defined outlets have a corresponding valid requirement, such as fiber for various levels of classification. Outlet configurations must comply with this TG and current version of TIA/EIA-568-B, and TIA/EIA-569-B. Outlet densities are provided for planning purposes. When actual outlet locations are not known and cannot be determined with available information, the designer can develop reasonably accurate total outlet count estimates based on the size and dedicated usage of the space. Actual designs shall include outlets in work areas, office (fixed wall) offices or areas where it would prove difficult to add telecommunications outlets at a later date shall have a minimum of two (2) dual outlets on different walls to accommodate furniture layouts. These factors fall within the ranges given in TIA/EIA-5 69-B, and are based on gross area (overall building footprint without deducting for hallways, equipment rooms, restrooms, etc.).

Table 1 - Outlet Types

Facility Space Category	•	Planning Area (SF(SM)) per Outlet
Administrative space, to include classrooms, and medical/clinics	Two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use.	80(7.5)
Headquarters and special users	Minimum of two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use, with additional 8- pin modular and/or fiber outlet/connectors as required.	80(7.5)
Systems furniture	Two 8-pin modular (RJ45 type) outlet/connector in a modular furniture outlet faceplate with outlet box extender, one connector labeled voice use, and one connector labeled data use.	See Para. 2.3.5.3
Non-admin spaces (CDCs, Chapels, Recreation centers, etc.)	Two 8-pin modular (RJ45 type) outlet/connector in a double gang outlet faceplate, one connector labeled voice use and one labeled data use.	500(46.5)
Barracks space/bachelor officer's quarters (BOQ)	See below	See Para. 2.3.5.2
Warehouse space	o 8-pin modular (RJ45 type) outlet/connector in ouble gang outlet faceplate, one connector eled voice use and one labeled data use.	
Wall and pay telephone outlet	One 8-pin modular (RJ45 type) connector in a single gang outlet faceplate with mounting lugs, labeled voice use.	
Family housing units	See below	See below
Wireless access points	One 8-pin modular (RJ45 type) connectors in a single gang outlet box labeled for data.	See below

## 2.3.5.1 Family Housing Units

Section: Appendix DD

The designer must determine the minimum outlet quantity for Army Family Housing (AFH) units based upon the number of rooms in the AFH unit. In general, provide one telephone outlet and one CATV outlet (as a minimum) in each of the following: kitchen, living room, dining room, family room/area, each bedroom, and any other logical location deemed appropriate. Copper outlet/connector must be TIA/EIA Cat 6 for U.S. Army and U.S. Air Force projects.

#### 2.3.5.2 Quarters

For U.S. Army barracks projects, provide one 8-pin modular (RJ45 type) connector in a single gang outlet faceplate, labeled voice use. In Bachelor Enlisted Quarters (BEQ), BOQ, Senior Enlisted Bachelor Quarters (SEBQ) etc., provide one single RJ-45 outlet in each room of the suite; i.e., bedroom and living room, configured per TIA/EIA-570.

## 2.3.5.3 Systems Furniture Wiring

The designer must specify a minimum of one systems furniture outlet per single occupancy cubicle. The designer must specify a minimum of two systems furniture outlets per cubicle designated for servers, printers, copiers, or facsimile (FAX) machines. When systems furniture is installed as part of the construction contract, ensure that systems furniture specifications include EIA American National Standards Institute (ANSI)/TIA/EIA-568-B and EIA ANSI/TIA/EIA-569-B cabling and raceway standards.

## 2.3.5.4 Wireless Access Point (WAP) Cabling

Wireless access points may be required in some situations. If the project management for IT has approved the inclusion of wireless in the design, the recommendations here should be followed. The designer should specify one-Cat 6, unshielded twisted pair (UTP) cable, each to a standard 8-pin modular connector for each wireless AP outlet. The Cat 6 cable can be used in conjunction with Power over Ethernet (PoE) to provide both power and data to the AP. The TIA/EIA technical committee TR-42 is currently working on a Technical Service Bulletin (TSB-162) Telecommunications Cabling Guidelines for Wireless Access Points. The intent of this TSB is to provide a pre-cabled grid to support 802.11 wireless local area networks (WLAN). The current guidance is to place one WAP at the center of each 55 by 55 foot (ft) square grid, for up to 20 users. For grid locations with over 20 users, provide two UTP cables. The TSB is based upon International Standards Organization (ISO)/International Engineering Consortium (IEC) TR 24704 Information Technology Customer Premises Cabling for Wireless Access Points. Both TIA and ISO utilize a 39-ft (12 meters (m)) diameter circle for WAP coverage. The designer should note that a wireless survey will be required after the completion of construction to ensure proper wireless coverage. The WAP grid provides a foundation for implementing wireless, but does not eliminate final wireless design.

#### CLARIFICATION/ENHANCEMENT:

Facility Space Category	(Area) Sq Ft per Outlet
Classroom XXI, Administrative/Clerical, Technical	50
Warehouse/Motor Pools	200
Hangars	500

JUSTIFICATION: Because of the lack of work area and the number of personnel occupying that space, the increase in the amount of jacks per area help alleviate the connection to voice/data requirements that exist for activities/units.

## Item: 2.4.1.1 - Copper Voice and Data

One Cat 6, for general projects, UTP cable must be installed to each standard 8-pin modular connector provisioned at the outlet. For example, install two 4-pair UTP cables to a standard administrative outlet, or one 4-pair UTP cable to each single connector outlet. Copper cables must not be split between multiple modular connectors. Use only cable that has passed the Underwriters Laboratory (UL) LAN certification program and is labeled with UL acceptable markings. Plenum cables must be provided IAW National Fire Protection Association, Inc. (NFPA) 70, or when directed by the facility safety officer or local building code. Provide terminations IAW the paragraph entitled "Copper Termination" in this TG. The designer must not use 150 ohm shielded twisted pair for new construction. The Cat 5, Cat 5e, and Cat 3 rated cable must not be used in new construction or rehabilitation projects.

## a. Copper Termination.

Terminations must be performed using an 8-pin (RJ45 type) connector, rated for the category of the installed cable. In a standard cabling scheme, horizontal cables are arbitrarily designated "voice" and "data" to identify and differentiate their purpose. Copper distribution cable must be terminated at the TR on 110-type cabinet or rackmounted patch panels compliant with Cat 6 for general projects. Very small projects (i.e., less than 10 user telephones) may use an EIA/TIA category qualified block or backboard mounted patch panel. Cables from the same outlet must be terminated on the same patch panel and individually identified. All terminations must be wired to the TIA/EIA T568A configuration. Do not use T568B wiring configurations unless specifically requested by the user and approved by the authority having jurisdiction. Copper cables must not be split between multiple modular connectors.

## b. Copper Patch Cables.

Copper patch cables must be 4-pair, 24 American Wire Gauge (AWG) stranded UTP cable,

rated for Cat 6, with 8-pin modular connectors at each end. Provide sufficient copper patch

cables, of various appropriate lengths, to terminate all copper patch panel appearances.

c. Category 6 Augmented and Category 7: CAT6A and CAT7 have not been authorized for use in the I3A because of the following unresolved issues. The TIA/EIA is the United States' trade organization and standards body that specifies structured cabling systems. The ISO/IEC is a network of the national standards institutes of 151 countries and is the international standards body responsible for specifying structured cabling systems. The TIA committee TR-42 has approved for publication the standard for 10G Base-T cabling, or augmented CAT6 (CAT6A): ANSI/TIA/EIA-568-B.2-10. The comparable ISO/IEC standard is ISO/IEC 11801 Addendum 1 Class EA. The ISO/IEC currently has a standard for a shielded-twisted pair (STP) cabling system, designated as

Class F. The TIA/EIA has not yet formed a task group to explore the standardization of ISO/IEC 11801 Class F as Category 7. CAT6A cable is 15-20 percent larger in diameter than CAT6 and CAT5e cable. USAISEC, as of the publication of this TC, has not yet been able to evaluate the impact to cable tray fill and the cost increase associated with the use of CAT6A cable. Class F (CAT7) cabling also introduces the following issues: larger cable diameter, proper grounding of shields, and non-compatible connectors.

CLARIFICATION/ENHANCEMENT: Copper distribution cables (voice and data) will be terminated at the TR in rack-mounted patch panel, compliant with Cat 6. Cables from the same outlet must be terminated on the same patch panel and individually identified with voice cables being terminated on the odd number ports and the data on the even number ports.

Copper jacks will be EIA/TIA Category 6, 9-pin/8 position insulation displacement terminations wired to match existing system (T568A or T568B). If there is no existing wire, they will be wired per T568A (normal). All drops will conform to the following wire color scheme. Green – Voice and Unclassified data (NIPRnet); Red – Classified data (SIPRnet); and Orange JWICS (Top Secret) (Appendix A)

JUSTIFICATION: It saves space in the TRs and allows NEC to maintain a more efficient area. Some of the older facilities at Fort Campbell have a termination of T568<u>B</u> instead of T568<u>A</u>. If adding additional drops in those areas, continue with matching termination. Any NEW infrastructure with no present wiring will be T568A.

## ITEM: 2.4.2.2 - Copper Termination

Termination shall be performed using 110-type connectors, rated for the installed cable. All terminations must be wired IAW TIA/EIA T568A. Twisted pair outside plant (OSP) cable is terminated on the Protected Entrance Terminal (PET), see paragraph 3. See figures B-5 and B-6 of Appendix B for details. Cross-connects can then be placed from the PET to the first set of 110-type terminal blocks as needed. The first set of terminal blocks provides connection for all backbones and for outlets served by the main TR. For main TRs that contain a telephone distribution frame, the horizontal main distribution frame (MDF) blocks must serve as the main cross connects. Refer to MDF description in the section on Dial Central Offices (DCO) in the USAISEC TG for Circuit Switching. For example, in a three-floor building, one backbone cable must be terminated on 110type blocks on the same backboard as the PET; one backbone cable should be terminated on 110-type blocks in the second floor TR; and one backbone cable should be terminated on 110-type blocks in the third floor TR. A backbone cable connects a second set of 110-type blocks in each TR to a rack mounted, 8-pin (RJ45 type) connector voice patch panel. This panel can be patched to the distribution patch panel, which in turn terminates the Cat 6 outlet wiring. Cross-connects can be done by the Director of Information Management (NEC)/telephone personnel, and jumpers can be installed by the user/Information Mission Area (IMA) department,

providing the desired connectivity between the OSP and the inside plant wiring. This design allows maximum flexibility for future moves, additions, and changes.

CLARIFICATION/ENHANCEMENT: Copper distribution cables (voice and data) will be terminated at the TR in rack-mounted patch panel, compliant with Cat 6. Cables from the same outlet must be terminated on the same patch panel and individually identified with voice cables being terminated on the odd number ports and the data on the even number ports.

JUSTIFICATION: It saves space in the TRs and allows NEC to maintain a more efficient area.

## ITEM: 2.4.4.7 – Small Facilities and Renovations

In new construction, particularly in large administrative or medical facility buildings, cable distribution systems must use the cable tray (or duct) and conduit systems as described. In new construction involving small, mixed use (non administrative) facilities, or construction projects involving renovation of existing buildings, use of "J" hooks, flexible cable tray, and alternative support systems specifically certified for Cat 6, cable is permissible, though not desirable. Surface mounted non-metallic raceway may be used in renovation projects where

access to the walls for installation of conduit and outlet boxes is not possible, or where historical requirements prohibit the alteration of the building structure.

CLARIFICATION/ENHANCEMENT: "J" hooks will not be used.

JUSTIFICATION: These hooks do not supply enough support and cause points of stress on the cable.

## ITEM: 2.5.4 - Room Door

The TR doors must be a minimum of 36 in (1 m) wide, 86 in (2 m) tall, without doorsill, hinged to open outward, and be fitted with a lock to control access to the room.

CLARIFICATION/ENHANCEMENT: Present buildings will have closet door(s) in Telecommunications rooms keyed separate from other locks in the building IAW DPW standards, with two copies of the key provided to the Supply Section of the NEC. On new construction or triaged buildings, closet doors will have a swipe card system installed.

JUSTIFICATION: Having a separate lock from others in the building provides for additional security and accountability of the expensive IT equipment. Swipe card access is the new standard for TRs as per ISEC.

## ITEM: 2.5.10 - Fiber Optic Patch Panels (FOPP)

Fiber optic patch panels should be installed in, or adjacent to, the equipment racks or cabinets, which will house LAN equipment. Patch panel connectors and couplers must be the same type and configuration as used elsewhere in the system. Utilize 568SC duplex connectors on 19-inch (475 mm) rack mounted panels, unless otherwise directed. Twenty-three inch (580 mm) rack mounted panels, or minimum 12x10 in (300x250 mm) wall mounted enclosures may be utilized when necessary, such as at small facilities in U.S. Army projects. A 3-ft (1-meter) slack loop of fiber must be provided within each panel, and panels must provide strain relief for cables. Patch panels must properly provide termination, splice storage, routing, radius limiting, cable fastening, storage, and cross-connection. Provide a minimum spare capacity of 10 percent in the installed patch panels.

CLARIFICATION/ENHANCEMENT: Fiber Optic patch panels WILL be installed in cabinets or racks that house the LAN equipment. No fiber optic patch panels will be installed on backboards unless specified by the NEC.

JUSTIFICATION: Patch panels need to be within a close proximity of the LAN equipment to make patching cables convenient and neat.

## ITEM: 2.5.15 - Electrical Power

Provide a minimum of two dedicated 120 volt, 20-ampere duplex receptacles in each TR. Each receptacle must be on a separate 20-ampere branch circuit serving only that receptacle. Additional convenience receptacles must be provided at 6 feet (1800 mm) intervals around the perimeter walls. For all projects, provide a dedicated 20-ampere circuit and a quadraplex receptacle for each 19 inches (480 mm) rack or cabinet. The designer must consult with the electrical designer or facilities engineer if the TR is to house blade servers, PoE switches, PoE mid-span hubs, or large numbers of network switches. The designer should determine estimated power draw of these devices. The electrical designer may have to compensate for the considerable current draw amount of these devices.

Design note for renovations: The designer must specify a disconnecting means as defined in the National Electric Code, Article 645.10, if the existing panel is not collocated or in close proximity of the branch-circuit power panel.

CLARIFICATION/ENHANCEMENT: A minimum of four dedicated 20 ampere, 110 volt AC outlets will be installed with each equipment rack or cabinet to provide power for installed equipment. Each communication rack will have a 1000 CA UPS installed. Electrician will coordinate with appropriate contractor for location and type of outlet.

JUSTIFICATION: Having the outlets on the communication racks allows for ease of use, prevents the use of extension cords to connect switches and UPS and also keeps cords from trailing on the ground causing safety issues.

ITEM: 3.3.2.1 - Copper

The number of OSP copper pairs is calculated by multiplying the number of users or jumpers in the building times 1.5 pairs. This factor will add in some additional pairs for faxes, modems, and special circuits. The cable is then sized to the nearest logical standard cable size. For example, a building with 85 users would require a 200-pair cable (85 x 1.5 =  $128 \rightarrow 200$  pair).

CLARIFICATION/ENHANCEMENT: A minimum of 25 pair copper is required.

JUSTIFICATION: No less than 25 pair copper will be run to any building. It allows for future growth without expending additional dollars for additions.

## ITEM: 3.5.2 – Utility Location

The NEC or DPW must be responsible for the location and marking of the utilities, unless otherwise stated in the design package. The installer must furnish a schedule of proposed excavation involving utility locations to the NEC/DPW in sufficient time to allow marking. Since each NEC/DPW has different operating requirements, the location lead-time must be stated in the design package. An acceptable utility mark must be within 24 inches (600 mm) of the edge of the utility. After the utilities are located and marked, the installer is responsible for maintaining the marks until they are no longer required. The intent is that the utilities must be located and marked only once and not after each rainfall.

CLARIFICATION/ENHANCEMENT: Cables for the NEC will be remarked upon justifiable request by the contractor. Contractor is not responsible to maintain the locates. The Contractor will place a call to Tennessee1 and locates will be done.

JUSTIFICATION: This practice is being done to cut down on the amount of cables and other utilities cut during the project.

## ITEM: 3.5.9.2 - Grass

All grass surfaces must be leveled and reseeded, unless otherwise directed (such as the placement of sod) in the design package. For grassy areas where the installer must have to bring heavy equipment back onto the construction site, the areas must be rough graded and covered with protective matting to prevent erosion. For durations longer than two weeks between construction and final disturbance, the installer must rough seed the area to provide cover until final grading and seeding are accomplished.

CLARIFICATION/ENHANCEMENT: ALL grass areas will be leveled and either place new sod, use of a mesh ground cover or hydraspray will be used to prevent erosion of soil.

JUSTIFICATION: Due to the number of construction projects and the rainy weather in the area, this form of restoration will help keep erosion to a minimum.

## ITEM: 3.6.3 - Direct Buried

The DB cable plant system is the preferred method for placement in less congested areas.

Supporting documentation for buried cable installation is available in RUS Bulletins 1751F-640 (http://www.usda.gov/rus/telecom/publications/1751f640.pdf), 641 (http://www.usda.gov/rus/telecom/publications/1751f641.pdf), and 642 (http://www.usda.gov/rus/telecom/publications/1751f642.pdf) and TIA/EIA-758, Customer Owned Outside Plant Telecommunications Cabling Standard.

Note: Above sites are located at the following URL under the BULLETINS Table (http://www.usda.gov/rus/telecom/publications/publications.htm)

CLARIFICATION/ENHANCEMENT: All cable splicing will be done either in manholes, hand holes, or pedestals. NO buried splices will be performed unless stated in writing by the NEC.

JUSTIFICATION: Buried splices do not protect the cable sufficiently, and are subject to freezing and thawing causing excessive unstable environmental conditions to the cable. This will allow ease of access for future maintenance requirements.

ITEM: 3.6.4 - Aerial

Aerial cable plant systems must not be used except as specified in the design package. Exceptions may include range cables or other long runs through undeveloped areas, in cases where underground systems cannot be installed, or in conformance to local mandates. Aerial pathways and spaces may consist of poles, messenger wire, anchoring guy wires, splice closures, and terminals.

CLARIFICATION/ENHANCEMENT: Aerial cable will not be engineered.

JUSTIFICATION: Aerial cable is subject to thermal in the air and also has been torn down by heavy equipment and large vehicles.

## ITEM: 3.7.1.3(b) – Accessories (locking covers)

Each new MH must be equipped with a lid, sump, pulling-in irons, ground rod, bonding ribbon, cable racks, and hooks. Accessories must be designed for use in a telecommunications MH. Cable hooks must be placed JAW RUS Bulletin 175 1F-643, RUS Bulletin 1753F-151, and the *AT&T Outside Plant Engineering Handbook*, August 1994, Practices 632-305-2 15 and 9 19-240-300 to support the weight of the cable and splice case.

Locking Covers – The first MH outside a DCO or wire node, MHs at critical junctions, or MHs equipped with carrier equipment will have lockable cover. Additional MHs may be identified as requiring lockable covers in the Statement of Work (SOW)/Engineering Design Plan (EDP). The preferred lockable lid cover is one that

utilizes a lever and clamp mechanism placed into a receiver that is installed into the cover. The mechanism will allow the cover to be replaced without indexing the cover to the frame. When locked, the mechanism will be flush with the frame surface minimizing the potential for the cover to be dislodged. The bolt used to secure the cover is available in many configurations and can only be turned with a socket provided by the manufacturer. The U.S. Government will select the bolt configuration. A disposable tamper evident plastic cap snaps into the lock body covering the recessed bolt head keeping dirt and debris out of the bolt area. An alternative means of securing the MH utilizes an inner, water resistant cover that can be locked by a General Services Administration (GSA)-approved, changeable combination lock. The U.S. Government will provide the locks.

CLARIFICATION/ENHANCEMENT: Manhole lids will be centered and locking. The manhole will include a ladder from collar to floor of same. Three keys will be turned into NEC supply for one manhole installation. An additional three keys will be required for every 10 manholes set. (Figure B)

JUSTIFICATION: The centered manhole lid provides for easier access to the cable inside and also lockable to prevent access by unauthorized personnel.

## ITEM: 3.7.1.5 – Stencil

All new Maintenance Holes must be stenciled with a number designated by the NEC. CLARIFICATION/ENHANCEMENT: Manhole name will be stenciled on the north side of the collar inside and also on the top of the lid.

JUSTIFICATION: This allows for ease of recognizing manholes and also the inside marking provides for recognition if the stenciling on the top of the lid wears off.

## ITEM: 3.7.2 – Hand Holes

Hand holes are reinforced concrete units provided with a lid that permits internal access to the housed components. Hand holes are typically used as pull points for small diameter cables for building access. A hand hole must not be used in place of a Maintenance Hole or in a main conduit system. Hand holes must not be used for splicing cables without prior U.S. Government approval. Telecommunications hand holes must not be shared with electrical installations. The minimum hand hole size is 4 ft x 4 ft x 4 ft (1.2 m x 1.2 m x 1.2 m). Larger hand holes (i.e., 1.2 m x 1.8 m x 1.2 m) are acceptable. Hand holes installed where vehicle traffic may be present must be load rated as H-20 and must be equipped with round Maintenance Hole lids.

CLARIFICATION/ENHANCEMENT: Hand holes will be no less than 4ft. X 6ft. X 6ft. unless otherwise stated in writing by the NEC. Hand hole lids must also be locking and three keys furnished to the NEC.

JUSTIFICATION: The larger hand hole allows more room for splice cases and ease of splicing. It also provides additional space for dark cable to be coiled up.

## ITEM: 3.7.4.5(e) – Minimum Duct Bank Sizing

Entrance conduits in minor buildings, as listed in the design package, must be a minimum of one-way, 4 inch (100-mm) ducts if the entrance cables are less than 1-inch (25-mm) diameter and if less than 40 percent of the duct area must be used.

CLARIFICATION/ENHANCEMENT: Entrance conduits in ALL buildings must be a minimum of two- 4 inch ducts.

JUSTIFICATION: Due to the number of buildings that are being used in a capacity different than purpose intended we require two ducts so no additional digging would be required for additional infrastructure installation.

## ITEM: 3.7.4.6 (a) - Duct Installation Guidelines

Depth of Cover: At least 24 inches (600 mm) of cover is required above the top of the duct bank. At least 18 inches (457 mm) of cover is required under roads or sidewalks (if duct is concrete-encased). For ducts installed in solid rock, the cover shall consist of at least 150mm (6 inches) of concrete. If rock is encountered below grade, the minimum cover above the concrete-encased duct shall be 12 inches (300mm). See Figure C-3 (Figure C-10 for Europe) – Conduit Placement/Cut and Resurface for details. The cover or fill shall be compacted IAW UFGS-02300, Earthwork.

CLARIFICATION/ENHANCEMENT: There will be 48" of cover required above the top of the duct or duct encasement.

JUSTIFICATION: Due to congestion of existing underground utilities.

## ITEM: 3.8.3 – Warning Signs

Buried cable warning signs or route markers must be provided no less than every 250 feet (76 m) or at each change in route direction, on both sides of street crossings, on pipelines, and on buried power cables. Color-coded warning signs or markers must be orange in color.

CLARIFICATION/ENHANCEMENT: Wording:

Underground Cable
Communications
Contact NEC at 798-9650 prior to

In addition, the signs should be installed as follows:

Section: Appendix DD Page 839 of 947

- Sign mounted to steel PSP stake; orange in color preferred
- 4ft. below ground in concrete; rising 5ft. above ground
- No more than 1ft. off the ditch line; perpendicular to the trench line
- If there is a change in direction, a sign should be positioned immediately at the turn showing the line
- Although I3A states every 250ft. for those areas that end up being less than 250ft. we request they be positioned accordingly, even if an additional sign needs to be added

JUSTIFICATION: Orange PSP stake and height/depth is due to the height of the grass, especially in rear areas, and the bush hogs used to cut the grass. It will hopefully give us a fighting chance of not being hit/damaged or mowed over.

## ITEM: 3.8.4 – Plowing

Plowing must be used in range environments or other areas where there are no significant obstacles and where cable runs typically exceed 1,000 feet (305 m) between splices. The design package must identify areas in which plowing is deemed feasible.

CLARIFICATION/ENHANCEMENT: When trenching or excavating in the cantonment area, under no circumstances will rotary trenchers or plowing be allowed. The NEC prefers the method of open trenching, using bucket type equipment, i.e., backhoe and track hoe. It is however, acceptable to use plowing and rotary trenching equipment in the rear areas. The maximum width of the trench is in accordance with the type of equipment used to dia.

JUSTIFICATION: Due to congestion of existing underground utilities.

## ITEM: 3.8.5 - Trenching

## 3.8.5.1 Backhoe Trenching

Trenching with a backhoe must be done only for short distances (i.e., MH to building). The installer must hand dig at all existing MH locations, building entrance points, utility crossings, through tree roots, under curbs, etc.

## 3.8.5.2 Trencher Trenching

A maximum trench width of 12 inches (300 mm) must be used in DB applications done by a trencher. The installer must hand dig at all existing MH locations, building entrance points, utility crossings, through tree roots, under curbs, etc.

CLARIFICATION/ENHANCEMENT: When trenching or excavating in the cantonment area, under no circumstances will rotary trenchers or plowing be allowed. The NEC prefers the method of open trenching, using bucket type equipment, i.e., backhoe and track hoe. It is however, acceptable to use plowing and rotary trenching equipment in

the rear areas. The maximum width of the trench is in accordance with the type of equipment used to dig.

JUSTIFICATION: Due to congestion of existing underground utilities.

## ITEM: 3.8.6 – Depth of Placement

## 3.8.6.1 Copper Cable

The depth of placement for a DB copper cable must provide a minimum top cover of 24 inches (600 mm) in soil, 36 inches (900 mm) at ditch crossings, and 6 inches (150 mm) in solid rock (RUS Bulletin 345-150/RUS Form 515A).

## 3.8.6.2 FOC

Direct buried FOC must be placed at a depth providing a minimum top cover of 42 inches (1070 mm). In solid rock, the minimum top cover must be 6 inches (150 mm).

## 3.8.6.3 Frost Considerations

In areas where frost heaving can be expected, the cable or wire should be buried below the frost line. Movement of OSP housings due to frost heaving can cause damage to the insulated copper conductors, optical fibers, or loss of shield and/or armor continuity. In areas where movement of OSP housings by frost heaving is encountered, the OSP housings should be installed on stub poles. The stub poles should be set below the frost line and IAW the requirements of RUS Form 515.

## 3.8.6.4 Other Considerations

The NEC/DPW may have special depth requirements for certain areas (i.e., tank tracks, ranges, etc.), which must be provided in the design package.

CLARIFICATION/ENHANCEMENT: Depth of cover for all communication cables is 48" of cover. There will be NO new Direct Buried Fiber Optic Cable.

JUSTIFICATION: Due to congestion of existing underground utilities.

## ITEM: 3.8.7 - DB Cable Splicing

Buried splices must be engineered and installed as identified in the design package. For example, a buried splice may be used for the following conditions with U.S. Government approval:

- Electrical or explosion hazard (i.e., ammunition areas)
- Vehicular hazard (i.e., motor pool areas)
- Security hazard (i.e., within a high security compound)

Only splice cases specifically designed for a buried application must be used. All buried splices must be encapsulated. All other splices in a DB run must be placed in pedestals or MHs. Encapsulation is not required in a pedestal.

CLARIFICATION/ENHANCEMENT: All cable splicing will be done either in manholes, hand holes, or pedestals. NO buried splices will be performed unless stated in writing by the NEC.

JUSTIFICATION: Buried splices do not protect the cable sufficiently, and the cables are subject to freezing and thawing causing excessive unstable environmental conditions to the cable. This will allow ease of access for future maintenance requirements.

## ITEM: 3.11 – Free Space Optics

The FSO can provide an alternative to FO connectivity, for the "last mile," to EUBs and small enclaves. Typical FSO implementations arise from one of the following factors that prohibit traditional infrastructure— rapid deployment, right of way permit issues, water, railroads, and rough terrain. The FSO is a line-of-sight (LOS), point-to-point, wireless optic technology that uses the transmission of modulated infrared beams through the atmosphere to obtain broadband communications. The FSO operates in the unlicensed near-infrared spectrum 750 nanometer (nm) to 1550 nm wavelength range. The FSO systems can function over distances of several kilometers (km), as long as there is a clear LOS between the source and the destination.

Design Note: For systems operating at 1.25 gigabits per second (Gbps) the link distance should be kept around 1000 meters. If the FSO system is to operate in an environment of low visibility (fog) a backup system (e.g., MMW, SHDSL, 802.1 1a) should be used.

There are a number of manufacturers producing FSO equipment. The designer should utilize an FSO device that was tested, approved, and recommended by the USAISEC TIC. The FSO equipment must be designed to prevent data loss due to temporary blockages, such as birds, smoke, dust, rain, and light fog. The FSO devices must be FDA and IEC 60825-1 Class 1M approved to ensure safety. Operational test reports on individual equipment are available from USAISEC TIC, such as TR No. AMSEL-IE-TI 04-009 November 2003 Free Space Optics (FSO) Comparison Report and TR No. AMSEL-IE-TI, 05-066, June 2005 Grafenwoehr Free Space Optics (FSO) Demonstration Report. transport the data stream.

CLARIFICATION/ENHANCEMENT: FSO will not be implemented unless approved in writing by the NEC.

JUSTIFICATION: All non-wired transmission falls under Spectrum Management. This type of equipment operates on an unlicensed frequency.

## ITEM: 3.15.2 - Cable ID/Cable Tags

Cable tags must be installed at all termination points (terminals) and splices, including house cables. In Maintenance Holes, all new and existing cables that are part of the project must be tagged/retagged between the splice and the wall and on both sides of a splice loop or maintenance loop. One tag is required for a copper cable pull-through, and two tags are required for a FOC pull-through.

CLARIFICATION/ENHANCEMENT: NEC will provide necessary cable tags for all TRs, Manholes, Pedestals, and Hand holes; labeled with cable names and counts.

JUSTIFICATION: This allows the NEC to standardize cable tags and make sure exact verbiage, counts, and names are correct. It prevents errors made due to poor handwriting or incorrect tag types. SEE CABLE NAMING CONVENTION DATED 19 NOV 2010.

## ITEM: 3.15.3.3 - Splices

- a. Copper and FOC splicing must be performed IAW RUS Bulletin 1735F-401, Standards for Splicing Copper and Fiber Optic Cable, February 1995.
- b. Cable must be spliced into one continuous length. All copper splices must be of the fold-back type to facilitate future work in the splice. Fiber cable must contain splice loops in trays IAW manufacturer's recommendations.
- c. Completed splices must meet similar performance and mechanical specifications of a single cable of the same overall length.
- d. Self-piercing electrical filled connectors must be used when splicing plastic-insulated conductors. The installer must place and install connectors using a tool specifically designed to place those connectors. In North America, a 25-pair splicing module, 3M-type MS2 or equal must be used. The same modules must be used throughout the project and must be consistent with previously installed connectors to preclude a requirement for a variety of installation tools. B-wire connectors must not be used. In Europe, a 10-pair splicing module system is used.
  - e. Binder group integrity must be maintained.
- f. All dead pairs in a copper cable must be spliced through if the size of the continuing cable must allow a clear and cap at the end. Only UL listed material must be used when capping cable pairs.
- g. All underground and buried splice cases must use encapsulant-fillable closures and must be filled with encapsulant upon completion of the splice IAW **RUS Bulletin** 345-72 (PE-74). Cable sheaths must be bonded at all cable splices with bonding harnesses to assure sheath continuity.

CLARIFICATION/ENHANCEMENT: "Preform" stainless steel splice cases are Fort Campbell's preferred standard for all copper cable splices, or an equivalent which will be approved by the lead planner or the Service Management Division Chief. NEC requires submittals for splice cases and splice modules prior to work beginning.

All splice cases shall be specified for the particular environment in which they will be placed and shall be sized to accommodate the cable count spliced. End plates shall be designed for the number and size of the cables served by the splice and shall be designed to seal around each cable individually. All splice cases shall be re-enterable and shall contain all necessary equipment to be installed properly, adhering to all appropriate electrical codes. Splices will be done in 710 instead of MS2.

JUSTIFICATION: Specific splice cases are required in order to protect the cable infrastructure. They have been used on the installation for a number of years with no problems or unsolvable issues. Their durability and reliability has been proven over many years of use. Using 710 splicing is more compact and ease of troubleshooting.

## ITEM: 3.17.3.1 – Fiber Termination Device

All strands of FOCs, both OSP and inside plant will be properly terminated on FOPPs. The OSP plant FOC will be extended IAW the National Electric Code standards into the main data closet/location of the building and terminated there. If the main data closet/location cannot be determined, the OSP FOC will be terminated on a lockable patch panel collocated with the copper PET. Inside plant FO riser cables between the main data closet/location and any satellite data closet(s)/location(s) will be terminated at both locations on the FOPPs. All FOPPs will be stenciled with the panel number and the cable count.

CLARIFICATION/ENHANCEMENT: Fiber optic cable (FOC) entering a facility will be terminated in a rack mounted Fiber Optic Patch Panel (FOPP). If lack of space for sufficient rack; FOPP will be mounted on backboard in coordination with written NEC approval.

JUSTIFICATION: Some of the older facilities at Ft. Campbell do not have sufficient space to provide a telecommunications room. In those instances a backboard mount is required.

## ITEM: 3.17.3.2 – Fiber Terminations

All terminations will be made using ST or SC connectors.

CLARIFICATION/ENHANCEMENT: All NEW terminations will be made using LC connectors. Any connectors already in place in triaged buildings or additional fiber connections in old buildings will be terminated with already present technology.

JUSTIFICATION: We are trying to standardize the connectors with the newest technology.

Clarifications/Enhancements

b. Army Regulation 380-5, "Department of the Army Information Security Program", Chapter 7, Section II, 7-3, dtd 29 September 2000.

ITEM: Standards for Storage Equipment

There are currently no deviations to this reference.

CLARIFICATION/ENHANCEMENT: All taclanes will be installed in a steel cage or safe shown at APPENDIX C. SIPR drops will be located at least 39 inches from any other type of media.

JUSTIFICATION: It protects the equipment physically and provides assurance for accountability of the NEC hand receipt. If room needing the SIPR has modular furniture, the SIPR drops will either be put in the floor in floor boxes according to standard or above the furniture.

c. "<u>Technical Guide for the Integration of Secret Internet Protocol Router Network</u> (SIPRNET), Version 5.0", dtd August 2008.

There are currently no deviations to this reference.

- d. National <u>Security Telecommunications and Information Systems Security</u> (NSTISSI) No. 7003, "Protective Distribution Systems (PDS)", dtd 13 December 1996. There are currently no deviations to this reference.
- e. NSTISSI\_TEMPEST/2-95, "Red/Black Installation Guidance", dtd 12 December 1995.

There are currently no deviations to this reference.

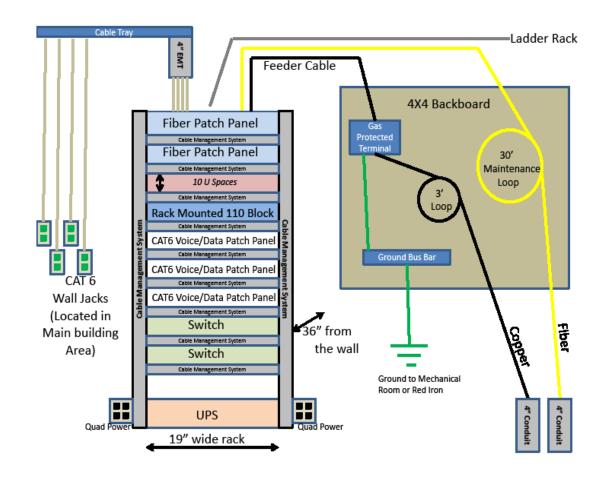


Figure A



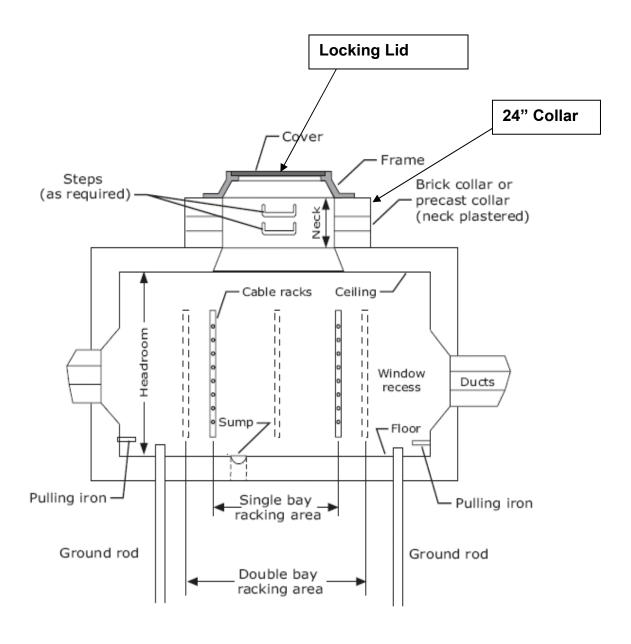
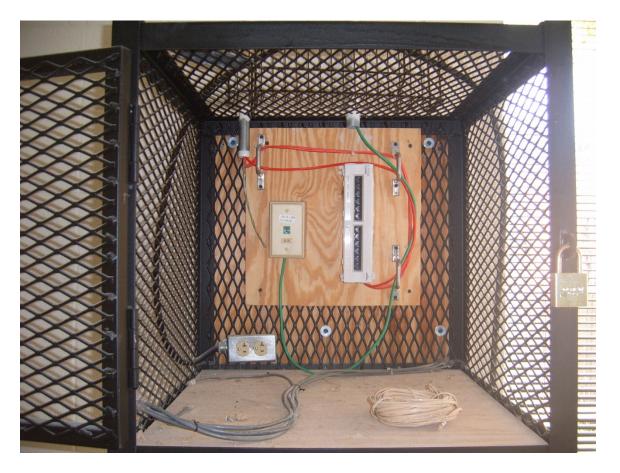


Figure B

## **TACLANE CAGE**



Size - 2'x2'x2'

Frame -  $1\frac{1}{2}$ "x $1\frac{1}{2}$ "x1/8" Angle Wire -  $\frac{3}{4}$ " #9 Flat Mesh Wire

Door Frame – 1"x1" Sq Box tube Hinge – 1 1/4"x4" 11 gauge hinge (2 ea)

Hasp -3"x3"x1/4" plate for hasp Lock -1"x2"x1/4" flange for lock

Bottom of cage – 12 gauge solid metal bottom

## NOTE:

- All joints must be welded wire mesh welded to angle frame and door frame.
- Hinge PMS tack welded
- Latch plate and flange fabricated and continuous welded
- 2 coats of flat back paint.
- Power and NIPR drop must be placed inside the cage.

## Figure C

# Appendix I Erosion and Sedimentation Control

## **TABLE OF CONTENTS**

**CHAPTER 11- INTRODUCTION** 

**CHAPTER 21- BORROW SITE PROCEDURES** 

**CHAPTER 31- EROSION AND SEDIMENTATION CONTROL** 

**CHAPTER 4I- RECLAMATION** 

**REFERENCES** 

Section: Appendix DD

**PERMIT FORM** 

## LIST OF TABLES

**Table 1. Fort Campbell Borrow Pit Locations** 

Table 2. Guidelines for selecting vegetative cover

Table 3. Size of riprap stones

Table 4. Guidelines for selecting permanent seeding

## **APPENDICES**

APPENDIX a Borrow Pit Location Maps

APPENDIX b Tennessee NPDES Permit Requirements
APPENDIX c Kentucky NPDES Permit Requirements

**Return to Table of Contents** 

#### **EXECUTIVE SUMMARY**

This plan provides information on erosion control for activities that result from opening, operating, and closing borrow pits on the Fort Campbell Military Reservation. This material is intended for use at Fort Campbell, KY by its military units and all authorized subcontractors. It provides step-by-step procedures to help plan, design, and install soil and water Best Management Practices (BMP). It does not override any local, city, county, state, or federal rule, regulation, or law, including job safety and utility safety laws. Where there is a difference between this plan and any language contained in any contractual document, the contractual document must be followed.

The standards and specifications listed in this manual provide criteria for the design, installation, and maintenance of water management and sediment control practices to abate nonpoint source (NPS) Pollution. Those responsible for design of these practices should evaluate the conditions existing on a particular site and determine if the minimum criteria contained in these standards are adequate or if more stringent criteria should be used.

Properly applied, this information will provide an efficient plan to operate the borrow pit site(s) while ensuring maximum safety and minimizing adverse impact to the environment. By following these guidelines, it is the intent of this management tool to furnish a uniform plan that will provide continuity throughout the life of the borrow pit.

## CHAPTER 11-INTRODUCTION

## General

It is the intent of this manual to help authorized borrow pit operators understand soil and water management practices. These Best Management Practices (BMP) recommendations are somewhat generalized because of wide variations in topography, geology, soils and plant requirements. Feasible ways to handle water management and to minimize erosion and sedimentation at the site are complex and vary according to each borrow pit location.

These guidelines will address borrow pit operations from site identification through final reclamation. The site manager as well as engineers and contractors must be fully cognizant of the environmental impact and strive to lessen the effect throughout the life of the project. This will also ensure minimal cost at the time of site closure.

## Site Selection

After establishing a need for borrow or topsoil, borrow areas shall be coordinated with program manager. A site should be reasonably close to construction areas, yet remote enough not to hinder future development. Access to the site should not create any undue safety problems. The site should be of sufficient size to provide safe operations and years of acceptable material. No previously used impact areas will be considered, due to the threat of unexploded ordnance.

The topography of the area should allow for excavation throughout the construction season. Wetlands shall be avoided, since altering or affecting them is subject to state or federal regulatory oversight and may require mitigation.

The material at the site must be acceptable to provide the fill requirements for projected construction. The initial determinations can be made with the use of soil surveys and the cooperation of the local county U.S. Natural Resource Conservation Service (NRCS). When fill materials appear to be acceptable, core drilling should be done to verify soil profiles. Laboratory testing is necessary to determine the natural moisture content, Atterberg limits, and compaction information.

## **Site Development**

Safety and environmental considerations are paramount in site development. All haul roads should be designed to ensure smooth traffic flow and they should have ample traffic width as well as full shoulders. Grades into and out of the pit area will not exceed safe slope percent of grade or length of slope. Main access roads will require a construction that will allow trafficability in most weather conditions. During dusty conditions, provisions will be made for dust control.

It is necessary to protect the environment throughout the life of the site and restore vegetation as soon as possible after material excavation. Off-site sediment migration must be kept to a minimum. The best way to protect from off-site sediment migration is to protect exposed soil and use sediment and runoff control measures.

The best way to minimize exposed soil is to prevent the pit operations from becoming larger than required for safe and efficient operations. As soon as the excavation of an area is complete, that portion shall be reclaimed and stabilized. If the active excavation area is kept below ten (10) acres then costly control measures such as sedimentation basins do not have to be designed, built, and maintained. However, it is not practical to mulch any of the active areas where borrow still remains because this would hamper fill compaction at the construction site. There are three active borrow pits on Fort Campbell; Patton Road, Angels Road and On-The-Line Road.

Sediment control measures will be constructed to prevent off-site sedimentation. The design size of these structures will be of sufficient size to prevent exposed soil from being transported off-site. Periodic maintenance and evaluation of these controls will be required.

A system of runoff control measures should be used to direct water away from the active borrow area. By diverting surface water from the active pit area, work may continue during rainy periods. These diversions can be constructed when removing vegetation and/or topsoil.

# **Site Operations**

To maintain the continuity of the operation, the Engineer Design Branch of the Directorate of Public Works, will oversee the operation of the borrow pit. This is imperative to control users operating in the pit, coupled with the longevity of the site.

Prior to any borrow excavation, sediment control measures should be designed and constructed. Runoff control measures necessary to ensure that water passes through the basin should also be constructed. An adequate network of roads should be

designed and constructed, keeping in mind that they will be used for the life of the borrow area. One-way roads are preferable for safety and ease of operations.

The pit will be opened at its lowest elevation to ensure positive drainage control. Any marketable timber should be harvested. All forest debris, brush and shrubs must be piled and disposed of in accordance with the procedures described in Chapter 2. Topsoil should be stripped and stockpiled. If there is no pending requirement for topsoil, the topsoil stockpile will be protected from erosion by seeding and mulch. The area of topsoil removal should expose enough borrow material for the projected year's construction. Borrow in the pit must be excavated to a controlled elevation. Reclamation design contours must maximize borrow removal while maintaining positive drainage.

As soon as practical after borrow removal, the area will be stabilized and revegetated. Reclamation should be close behind the pit operations and completed contemporaneously with borrow excavation. Topsoil replacement will expedite revegetation and cover acid forming subsoil. Prior to preparing the soil for seeding, soil tests should be taken and soil amendments applied according to recommendations. If no topsoil is replaced, then the acid forming potential of the subsoil should be considered in lime recommendations. The prepared area will be seeded with a mixture of legumes and warm season grasses. The seeded area will be mulched at the rate of three tons of straw or hay per acre. The mulch will be crimped (or otherwise stabilized) into the soil.

## Responsibilities

<u>SITE MANAGER</u>. The site manager is Joseph D. Whitfill, Engineer Design Branch, 798-3113. It is his responsibility of to ensure safe and continuous operations of the site. The site manager will direct the general operations of the contractors and other users operating in the pit area. The site manager will direct all maintenance of roads and control measures. The site manager shall issue a permit to operate in the borrow pit.

<u>CONTRACTOR/USER</u>. The contractor and other users will meet with the site manager prior to operating in the pit. It will be the responsibility of the contractor/user to maintain pit roads and adhere to safe operating procedure.

<u>PROVOST MARSHALL</u>. The Provost Marshall will periodically patrol the area to inspect for unauthorized use of the area.

# **Storm water Permitting**

Storm water runoff from construction activities is one facet of water quality and quantity management that is being regulated on construction sites of a certain size through the U.S. Environmental Protection Agency (EPA). The storm water permit program was enacted by Congress in 1987 in the amendment to The Water Pollution Control Act. This program falls under the National Pollution Discharge Elimination System (NPDES).

The program presently applies only to those construction sites that will disturb five or more acres. The area of disturbance is defined as that portion of the site where ground cover and/or topsoil is removed, as contrasted with areas where tree or shrub clearing is the only activity.

Programs vary from state to state and appropriate state agencies should be consulted before borrow pit activities begin to determine applicability.

The Fort Campbell representative can be contacted at:

Directorate of Directorate of Public Works Compliance Branch Storm Water Program Manager (502) 798-9784

**Return to Table of Contents** 

## **CHAPTER 21–BORROW SITE PROCEDURES**

## Clearing and Grubbing

## **Description**

This work is associated with the clearing, grubbing, removing and disposing of all vegetation and debris. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

The work under this section shall also consist of removing and disposing of dead, diseased, poorly formed or other trees designated by the site manager to be undesirable and shall include removal and disposal of undergrowth, stumps of uprooted trees, logs, vines, other undesirable vegetation, and all debris designated by the site manager.

## **Specifications**

- a) General
- 1. The site manager will establish borrow pit boundary lines, construction lines and designate all trees, shrubs, plants and other items to remain. Any damage to natural terrain or to vegetation or objects designated to remain shall be repaired, replaced, or otherwise compensated for, as determined by the site manager, at the expense of the Contractor. All cut or scarred surfaces of trees or shrubs shall be treated with an asphaltum base paint especially prepared for tree surgery.
- All marketable timber within the construction and easement limits which have not been removed prior to the beginning of borrow operations, along with other timber within the right of way designated by the site manager for removal, shall remain the property of the US Government, unless otherwise specified by the plans or proposal.

Section: Appendix DD Page 853 of 947

## B) Clearing

1. The area within the construction lines shall be cleared of all surface objects and all trees, stumps, roots and other objectionable obstructions resting on or protruding through the surface of the original ground not designated to be retained.

2. Areas outside the borrow lines shall be selectively cleared of designated dead wood, undergrowth, rubbish and other objectionable matter, designated trees and stumps. This includes trimming and treatment of damaged trees (in accordance with good tree surgery practice). Natural ground cover shall be protected insofar as practical.

## c) Grubbing

All areas within the construction lines shall be grubbed of all objectionable matter on or projecting through the ground surface. All fill areas shall be grubbed to a depth at least one foot below the natural ground.

## d) Disposal of Materials

- 1. The Contractor shall submit prior to beginning work, a plan for the satisfactory disposal of material and debris from the clearing and grubbing operations for approval by the site manager.
- 2. The plan shall provide for the satisfactory disposal of perishable materials and rubbish within 30 days after accumulation, unless a longer period is authorized in writing by the site manager, to prevent infestation of pests. No material may be buried on the Fort Campbell installation.
- 3. Some acceptable methods of disposal may include:
  - a) LANDFILLING

All materials designated for landfill disposal may be deposited in the nearest permitted off-post landfill.

## b) RECYCLING

The use of mechanical brush clippers or other recycling methods for vegetation will be considered for approval.

## c) WINDROW

Biodegradable materials may be windrowed on site.

# **Topsoil Removal**

## **Description**

Topsoil is defined as a natural, workable, friable, loamy soil without a mixture of subsoil, refuse, or foreign materials, reasonably free from hard lumps, stiff clay, hardpan, gravel, noxious weeds, brush, or other undesirable material, and suitable for growing grasses, legumes, or other vegetative ground cover.

Acceptable topsoil shall be well drained and has a healthy vegetative growth, and does not contain toxic amounts of either acid, alkaline, or other phytotoxic elements. The areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed in quantity, the product will be homogeneous in nature and of acceptable quality.

## **Specifications**

## a) General

All areas from which topsoil is to be stripped shall be cleaned of all refuse which will hinder or prevent seedbed preparation or growth. When securing topsoil from approved areas, should unforeseen strata or scams of material occur which do not meet the requirements for topsoil, such material shall be removed from the topsoil and disposed of as directed or if directed, the area shall be abandoned.

## b) Hauling Topsoil

Topsoil shall be hauled in vehicles suitable for the purpose. Scrapers of reasonable capacity will be considered as acceptable; however, excessive spillage will not be tolerated and loads shall be controlled to prevent such spillage. Topsoil spilled on subgrade or other base or pavement structure layers shall be removed immediately.

## c) Maintenance

The topsoil that has been set aside shall be maintained through seeding, sodding, planting, or other work, until final completion of the project. Maintenance shall consist of preserving, protecting, and such other work as may be necessary to keep the work in a satisfactory condition.

d) Topsoil may only be placed in the borrow pit area with the approval of the site manager. All topsoil must be free of any foreign debris. No topsoil will be accepted which has large rock, asphalt, metal or other materials.

## Access Roads

## Description

Access road design and development shall consider the longevity of the borrow pit operation. Since the entire area is projected for borrow removal, a main access road will be constructed around the perimeter of the site. The road will be designed with drainage and a graveled treadway to serve as an all weather road.

Temporary pit roads from the main access road can be constructed with borrow material. At no time will any road prevent the active borrow site drainage from passing through the sediment basin.

Section: Appendix DD Page 855 of 947

## **Specifications**

## a) General

- 1. Temporary roads shall follow the contour of the natural terrain to the extent possible. Slopes should not exceed 10 percent.
- 2. Temporary parking areas should be located on naturally flat areas to minimize grading. Grades should be sufficient to provide drainage but should not exceed four (4) percent.
- 3. Roadbeds should be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic.
- 4. Drainage ditches shall be provided as needed and shall be designed and constructed to carry anticipated storm flows.
- 5. The roadbed or parking surface shall be cleared of all vegetation, roots and other objectionable material.
- 6. A 6-inch course of clean aggregate shall be applied immediately after grading. Filter fabric may be applied to the roadbed for additional stability in accordance with fabric manufacturer's specifications.

## b) Construction Entrance

- 1. A gravel construction entrance is a pad of crushed stone that reduces the tracking of mud onto the adjacent road. To construct the pad, place a layer of 2- to 3-inch stone across the full width of the vehicle ingress and egress area. The stone pad should be at least 50 feet long and at least 6 inches thick. Additional stone may have to be added periodically to maintain the proper functioning of the pad.
- 2. There will be no washing of wheels in the borrow site.

## c) Maintenance

Both temporary and permanent roads and parking area may require periodic top dressing with new gravel. Seeded areas adjacent to the roads and parking areas should be checked periodically to insure that a vigorous stand of vegetation is maintained. Roadside ditches and other drainage structures should be checked regularly to ensure that they do not become clogged with silt or other debris. The paved roads in the area will be inspected daily by the contractor/user and all mud/dirt deposits removed. The site manager along with authorized contractors shall maintain all access and pit roads.

## **Dust and Pollutant Control**

## **Description**

Dust and pollutant control measures are implemented to reduce surface and air movement of dust and other pollutants during land disturbing, demolition, and other construction activities. The purpose of these controls is to prevent surface and groundwater contamination and air transport of dust and other pollutants from exposed surfaces and to reduce the presence of airborne substances that may be harmful or injurious to human health, welfare, and safety, or to animals and plant life. This practice is applicable to heavy use areas on the borrow site and to areas subject to surface and air movement of dust where, without treatment, on-site and off-site damage may occur.

Earth moving activities cause the largest amount of construction dust emissions. The less soil exposed at one time, the less potential there is for dust generation. Therefore, dust control should involve phasing of borrow pit activities and utilizing temporary stabilization measures upon completion of grading.

Oil, gasoline, grease, solvents and other pollutants are associated with equipment used on construction sites. The level of equipment maintenance and repair will, of course, depend upon the size and complexity of the project. Whenever equipment must be serviced, special precautions should be taken.

## **Specifications**

## a) General

Blowing dust may be controlled permanently or temporarily, depending on the needs of the site. The following summarizes available temporary dust control methods:

## b) Temporary Practices

- <u>Mulching</u>: Chemical mulch binders may be used instead of asphalt to bind mulch materials. Binders such as Curasol or Tenatack should be used according to manufacturer's recommendations.
- Vegetative Cover: Refer to Temporary Seeding measures in Chapter 3.
- <u>Spray-on-Adhesives</u>: These are used on mineral soils (not effective on muck soils); traffic should be kept off the area. Apply under proper weather conditions according to manufacturer's directions.
- <u>Wetting</u>: Water can be sprayed by truck or by hand, along the access roads and in the work area to hold down the dust.

## c) Permanent Practices

- <u>Permanent Vegetation:</u> Existing trees and large shrubs may afford valuable protection if left in place. Also refer to Permanent Seeding section of this manual (see Chapter 4, B).
- <u>Top soil:</u> This entails covering the surface with less erosive soil material. Refer to section in this manual on Topsoil (see Chapter 4, A).
- Stone: Cover surface with crushed stone or coarse gravel.

Maintenance and repair of equipment should be confined to areas specifically designed for that purpose. These areas should have adequate waste disposal receptacles for liquid as well as solid waste. Take waste oil to designated waste oil collection areas for recycling. On sites where designed areas for equipment servicing is not feasible, special care should be taken to assure that potential pollutants cannot be washed into nearby receiving streams.

Adequate sanitary facilities, such as chemical toilets, should be placed near maintenance areas or other convenient sites on the construction area.

Scrap from maintenance and other construction litter should be placed in containers or otherwise disposed of properly.

Maintenance areas should be inspected and cleaned daily.

## Oil and Grease

To eliminate the potential of large spills, no stationary fuel tanks are permitted at the site. Refueling and lubrication of equipment can only be performed at the site by a portable fueling/servicing truck. Unserviceable equipment must be evacuated from the site for repairs.

## **Spoil from Construction Sites**

Spoil from construction sites on Fort Campbell will be accepted into the open borrow pit or closed pit located on On the Line Road or recycled per project manager. Spoil must be separated as to topsoil or subsoil. It will contain no asphalt or large rocks, metal or other construction debris. All soil will be placed at a site designated by the site manager, deposited in lifts, capped and temporarily seeded. It is the contractor's responsibility to ensure compliance with this requirement.

## Permit to use Borrow Pits.

Any contractor wishing to either excavate soil or dispose of spoil must obtain a permit from the site manager prior to operations. The permit must be maintained by all trucks and equipment operating within the borrow pit. Failure to keep proper documentation within the vehicles could result in fines imposed for improper access and dumping. The contractor must provide at a minimum the contract number, quantity of soil to be moved, type of soil, and the dates of operation. The form is located at App C.

**Return to Table of Contents** 

## **CHAPTER 3I-EROSION AND SEDIMENTATION CONTROL**

## **Sediment Control Measures**

# **Sedimentation Basin**

## Description

A sedimentation basin is a temporary barrier or dam constructed across a watercourse or at other suitable locations to retain sediment and other waterborne debris. They are required by the EPA

Temporary sediment basins are used as a means of trapping and storing sediment from eroding areas in order to protect downstream areas from damage resulting from sedimentation and waterborne debris.

Sedimentation basins should be used at sites where:

- Failure of the structure would not result in loss of life; damage to homes; commercial, or industrial buildings; damage to highways or railroads, or interruption of use or service or private utilities.
- 2. The height of dam is 25 feet or less, as measured from the natural streambed at the downstream toe of dam to the top of dam.
- 3. The product of the total volume of storage (acre-feet) and the height of dam (feet) is not greater than 3,000.
- 4. The drainage area is 100 acres or less.
- 5. The basin will be removed within a three-year period after construction.

Temporary sediment basins apply where physical site conditions or other restrictions preclude the installation of erosion control measures to adequately control erosion and sedimentation. It may be used downslope from borrow operations that expose areas to erosion. Temporary sediment basins will be removed after the exposed areas are adequately protected against erosion by vegetative or mechanical means.

## Regulation

Unless otherwise excepted, all dams with a height of 25 feet or more, or storage of 50 acre-feet or more, require detailed construction plans prior to the start of construction. The height of the dam is measured from the natural streambed at the downstream toe of dam to the top of dam.

Design and construction shall comply with all federal, state and local laws, ordinances, rules and regulations.

## **Planning Considerations**

Sediment basins are typically only 70-80 percent effective in trapping sediment that flows into them. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

To improve the effectiveness of the basin, it should be located so as to intercept the largest possible amount of runoff from the disturbed area. The best locations are

generally low areas and natural drainage ways below disturbed areas. Drainage into the basin can be improved by the use of stabilized diversion dikes and ditches. The basin must not be located in a live stream but should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Sediment basins may be designed as permanent structures to remain in place after construction is completed. Site conditions may make the use of these structures desirable for storm water detention purposes. Wherever these structures are to become permanent, or if they exceed the size limitations of the design criteria, they must be approved by the DPW and designed as permanent ponds by a qualified Professional Engineer.

## **Specifications**

## (a) Embankment Basin

- The foundation area shall be cleared of all trees, stumps, roots, and brush boulders, sod, and debris. All channel banks and sharp breaks shall be sloped to no steeper than 1:1. All topsoil containing excessive amounts of organic matter shall be removed. The surface of the foundation area will be thoroughly scarified before placement of the embankment material.
- 2. The cutoff trench shall be excavated to the lines and grades shown on the plans or as changed during construction because of site conditions, and shall be backfilled with suitable material in the same manner as specified for earth embankment. The trench shall be kept free of standing water during backfill operations.
- 3. Existing stream channels crossing the foundation area shall be sloped no steeper than 1:1 and deepened and widened as necessary to remove all stones, gravel, sand, roots, and other objectionable material and to accommodate compacting equipment. Such channels shall then be backfilled with suitable material as specified for each embankment.
- 4. The pipe conduit barrel shall be placed on a firm foundation to the lines and grades shown on the plans. Selected backfill material shall be placed around the conduit in layers, and each layer shall be compacted to at least the same density as the adjacent embankment. All compaction within 2 feet of the pipe spillway will be accomplished with hand-operated tamping equipment.
- 5. The material placed in the fill shall be free of all sod, roots, frozen soil, stones more than 6 inches in diameter, and other objectionable material. The placing and spreading of the fill material shall be brought up in approximately 6-inch horizontal layers or of such thickness that the required compaction can be obtained with the equipment used. Construction equipment shall be operated over the area of each layer in a way that will result in the required compaction.
- 6. Special equipment shall be used when the required compaction cannot be obtained without it.

7. The distribution and gradation of materials throughout the fill shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Where it is necessary to use materials of varying texture and gradation, the more impervious material shall be placed in the upstream and center portions of the fill.

- 8. The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.
- 9. Fill shall not be placed on frozen, slick or saturated soil.

The topsoil material saved in the site preparation shall be placed as a top dressing on the surface of the emergency spillways, embankments, and borrow areas. It shall be evenly spread to a thickness as specified on the plans.

A protective cover of herbaceous vegetation shall be established on all exposed surfaces of the embankment and spillway to the extent practical under prevailing soil and climatic conditions.

## **Excavated Basins**

The completed excavation shall conform to the lines, grades and elevation shown on the plans.

The material excavated from the basin shall be placed in one of the following ways so that its weight will not endanger the stability of the side slopes and where it will not be washed back into the basin by rainfall:

- 1. Uniformly spread to a height not exceeding 3 feet with the top graded to a continuous slope away from the basins.
- Uniformly place or shape with side slopes assuming the natural angle of repose for the excavated material behind a berm width equal to the depth of the basin, but not less than 12 feet.

1. .

## **Planning Considerations**

- 1. Straw bale barriers that are used in streams and drainage ways with high water velocities and volumes will be destroyed or have diminished effectiveness.
- 2. Improper placement and installation of the barriers, such as staking the bales directly to the ground with no soil seal or entrenchment, will allow undercutting and end flow. This will result in additions of, rather than removal of, sediment from runoff waters. Inadequate maintenance lowers the effectiveness of these barriers. Trapping efficiencies of carefully installed straw bale barriers can drop from 57 percent to 16 percent in one month due to lack of maintenance.

## **Specifications**

Section: Appendix DD

## a) Sheet Flow Applications

- 1. Bales shall be placed in a single row, lengthwise on the contour, with both ends of adjacent bales tightly abutting one another.
- 2. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of the bindings).
- 3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.
- 4. Each bale shall be securely anchored by at least two stakes or rebars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or rebars shall be driven deep enough into the ground to securely anchor the bales.
- 5. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. (Loose straw scattered over the area immediately uphill around a straw bale barrier tends to increase barrier efficiency.)
- 6. Inspection shall be frequent, and repair or replacement shall be made promptly as needed.
- 7. Straw bale barriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

## b) Channel Flow Applications

- 1. Bales shall be placed in a single row, lengthwise, oriented perpendicular to the contour, with ends of adjacent bales tightly abutting one another.
- 2. The remaining steps for installing a straw bale barrier for sheet flow applications apply here, with the following addition:
- 3. The barrier shall be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment laden runoff will flow either through or over the barrier, but not around it.

## Maintenance

- 1. Straw bale barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
- 2. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales.
- 3. Necessary repairs to barriers to replace bales shall be accomplished promptly.

4. Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.

5. Any sediment deposit remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

## Silt Fence

## **Description**

A silt fence is a temporary barrier to trap sediment that consists of a filter fabric stretched between supporting posts, with the bottom entrenched in the soil. The Silt Fence is a temporary linear filter barrier constructed of synthetic filter fabric, posts, and, depending upon the strength of the fabric used, wire fence for support. The purpose of a silt fence is to intercept and detain small amounts of sediment from disturbed areas during construction operations in order to prevent sediment from leaving the site and damaging streams or entering sinkholes.

Silt fences should be used under the following conditions:

- Below disturbed areas where erosion would occur in the form of sheet and rill erosion and
- 2. Where the size of the drainage area is no more than 1/4 acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1) and
- 3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 2 acres and
- 4. Under no circumstances should silt fences be constructed in live streams or in swales or ditch lines where flows are likely to exceed 1 cubic foot per second (cfs).

## **Specifications**

- a) General
- 1. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier.
- 2. Burlap shall be 10-ounce per square yard fabric.
- 3. Posts for Silt Fences shall be either 2-inch diameter wood or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them. They should be installed 10 feet on center.
- 4. Wire fence reinforcement for silt fences using standard strength filter cloth shall be a minimum of 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.
- 5. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stake and upslope from the barrier.

6. The filter material shall be attached to the stakes, and 8 inches of fabric shall be extended into the trench. Filter material shall not be stapled to existing trees.

7. The trench shall be backfilled and the soil compacted over the filter material.

#### Maintenance

- 1. Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
- 2. Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, the fabric shall be replaced promptly.
- 3. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
- 4. Any sediment deposit remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

#### **Runoff Control Measures**

#### **Diversion**

#### **Description**

A diversion is a channel constructed across a slope with a supporting ridge on the lower side. The purpose of the structure is to reduce slope length and to intercept and divert storm water runoff to stabilized outlets at non-erosive velocities.

Diversions should be used under the following conditions:

- 1. Where runoff from higher areas may damage property, cause erosion, or interfere with the establishment of vegetation on lower areas.
- 2. Where the slope length needs to be reduced to minimize soil loss.

#### **Planning Considerations**

Diversions can be useful tools for managing surface water flows and preventing soil erosion. On moderately sloping areas, they may be placed at intervals to trap and divert sheet flow before it has a chance to concentrate and cause rill and gully erosion. They may be placed at the top of cut or fill slopes to keep runoff from upland drainage areas off the slope. They can also be used to protect structures, parking lots, adjacent properties, and other special areas from flooding.

Diversions are preferable to other types of man-made storm water conveyance systems because they more closely simulate natural flow patterns and characteristics. Flow velocities are generally kept to a minimum. When properly coordinated into the landscape design of a site, diversions can be visually pleasing as well as functional.

As with any earthen structure, it is very important to establish adequate vegetation as soon as possible after installation. It is equally important to stabilize the drainage area

Section: Appendix DD Page 864 of 947

above the diversion so that sediment will not enter and accumulate in the diversion channel.

A diversion channel must have a minimum capacity to carry the runoff expected from a 10-year frequency storm with a freeboard of at least 0.3 foot.

#### **Specifications**

- 1. All dead furrows, ditches or other depressions to be crossed shall be filled before construction begins or as part of construction, and the earthfill used to fill the depressions will be compacted using the treads of the construction equipment. All old terraces, fence rows, or other obstructions that will interfere with the successful operation of the diversion will be removed.
- 2. The base for the diversion ridge is to be prepared so that a good bond is obtained between the original ground and the place filled. Vegetation is to be removed and the base thoroughly disked prior to placement of fill.
- The earth materials used to construct the earth fill portions of the diversions shall be obtained from the diversion channel or other approved source.
- 4. The earthfill materials used to construct diversions shall be compacted by routing the construction equipment over the fill in such a manner that the entire surface of the fill will be traversed by not less than one tread track of the equipment.
- 5. The completed diversion shall conform to the cross section and grade shown on the design.
- 6. Fertilizing, seeding, and mulching shall conform to the recommendations in the applicable vegetative standard and specification.
- 7. If there is no sediment protection provided on temporary diversion, it should be anticipated that periodic cleanout may be required.
- 8. Construction operations shall be carried out in such a manner that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement shall be followed.

#### Maintenance

Before final stabilization, the diversion should be inspected after every rainfall. Sediment shall be removed from the ditchline and repairs made as necessary. Seeded areas that fail to establish a vegetative cover shall be reseeded as necessary.

### **Waterway**

#### **Description**

A waterway is a natural or constructed waterway or outlet shaped or graded and established in suitable vegetation as needed for safe disposal of runoff water. The

purpose of a waterway is to provide for the disposal of excess surface water from construction sites without causing erosion.

Supplemental measures may be required with this practice. These may include such things as (1) grade control structures, (2) subsurface drainage to permit growing suitable vegetation and to eliminate wet spots that may be a nuisance, (3) a paved channel bottom or buried storm drain to handle storm runoff, base flow or snowmelt.

The location of waterway channels is of considerable importance to a good program of erosion and sedimentation control. Wherever possible, the site manager should preserve the natural drainage system. Waterways should generally be located in natural drainageways where water can drain in from all sides. When the establishment of vegetation is required, moisture conditions and soil fertility are usually best in such areas. Waterway channels should be located so that they do not make sharp, unnatural changes in direction of flow.

All waterway channels should have stable outlets with adequate capacity for the designed flow. The outlet may be another vegetated channel, an earth ditch, a structure, or other suitable outlet. In all cases, the outlet must discharge in such a manner as not to cause erosion. Outlets should be constructed and stabilized prior to the operation of the waterway channel. Applicable drainage laws, traditional case law precedent and local ordinances and regulations must be observed in locating waterway channels and outlets.

#### **Specifications**

- 1. All trees, brush, stumps, and other objectionable material shall be removed and disposed of in a manner so that they will not interfere with construction or the proper functioning of the waterway or outlet.
- The waterway or outlet shall be constructed to the dimensions specified on the design, and the cross section shall be free from bank projections or other irregularities.
- 3. All ditches or other depressions below the designed grade will be back filled with fill material that is free from brush, roots, sod or other perishable material, and rocks in excess of 6 inches in diameter. Backfill will be placed in approximately uniform horizontal layers of not more than 9 inches in thickness and each layer will be compacted using the treads or tracks of the construction equipment.
- 4. After the waterway has been constructed to proper grades and cross section with proper allowance for topsoil, the topsoil will be uniformly spread over the area to a minimum depth of 4 inches.
- 5. Waterways or outlets shall be protected against erosion by vegetative means as soon after construction as practical and before diversions or other channels are released into them. Consideration should be given to sodding channels to provide erosion protection immediately after construction.

#### Soil Stabilization Measures

The following soil stabilization techniques should be implemented if borrow pit sections are not closed as soon as excavation is complete.

#### **Temporary seeding**

#### **Description**

Temporary seeding is used to establish a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing annual plants. The purpose of temporary seeding is to reduce erosion and sedimentation by stabilizing disturbed areas that will not be brought to final grade for a year or less and to reduce problems associated with mud and dust production from bare soil surfaces during construction.

Temporary seeding is necessary where exposed soil surfaces are not to be fine-graded for periods from 30 days to one year. Such areas include denuded areas, soil stockpiles, sides of sediment basins, temporary roadbanks, etc.

#### Planning Considerations

Sheet erosion, caused by the impact of rain on bare soil, is the source of most fine particles in sediment. To reduce this sediment load in runoff, the soil surface itself should be protected. The most efficient and economical means of controlling sheet and rill erosion is to establish vegetative cover. Annual plants that sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover.

Temporary seeding may prevent costly maintenance operations on other erosion control systems. For example, sediment basin clean-outs will be reduced if the drainage area of the basin is seeded where excavation is not taking place.

Temporary seeding is essential to preserve the integrity of earthen structures used to control sediment, such as diversions, and the banks and dams of sediment basins.

#### **Specifications**

#### a) General

Prior to seeding, install necessary erosion control practices such as waterways and basins.

#### b) Plant Selection

Select plants appropriate to the season and site conditions. The local Natural Resource Conservation Service may supply more specific information upon request.

#### c) Seedbed Preparation

To control erosion on bare soil surfaces, plants must be able to germinate and grow. Seedbed preparation is essential. The following must be considered prior to seeding:

Plant or Plant Mixture	Application Rate per Acre	Plant Dates	
Rye	3 bushels	Aug. 15 - Nov. 1	
Wheat	2-3 bushels	Sept. 1 - Nov. 1	
Annual Ryegrass	30 pounds	Aug. 15 - Nov. 1	
Browntop or Pearl Millet	20 pounds	Apr. 1 - July 15	
Fescue	10 pounds	Mar 1- May 30	
Clover/Red or White	5 pounds	5 pounds 28 Feb -15 Apr	
		15 Sep - 1 Nov	
Warm Season Grasses	3-7 pounds	Apr 1 – Sep 30	

- 1. <u>Liming</u>: Where soils are known to be highly acidic (pH 5.5 and lower), lime should be applied at the rate of two tons of pulverized agricultural limestone per acre, or in accordance with local extension office recommendations.
- 2. <u>Fertilizer</u>: Shall be applied as 500 pounds/acre of 6-12-12 (10 pounds/1,000 ft<sup>2</sup>) or equivalent. Lime and fertilizer shall be incorporated into the top 2 to 4 inches of the soil.
- 3. <u>Surface Roughening</u>: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted, or hardened, the soil surface shall be loosened by disking, raking, harrowing, or other acceptable means.
- 4. <u>Tracking</u>: Tracking with bulldozer cleats is most effective on sandy soils.

#### c) Seeding

Table 1. Guidelines for selecting vegetative cover

Seed shall be evenly applied with a cyclone seeder, drill, cultipacker seeder or hydroseeder. Small grains shall be planted no more than one-inch deep. Grasses and legumes shall be planted no more than 1/4-inch deep.

#### d) Mulching

- 1. Seedings made in fall for winter cover shall be mulched.
- 2. At other times of the year, seedings made on slopes in excess of 4:1, or on adverse soil conditions, or during excessively hot or dry weather, shall be mulched.
- 3. Seedings made during optimum spring and summer seeding dates, with favorable soil and site conditions, will not require mulch.

Page 868 of 947

#### **Ground Cover**

Section: Appendix DD

#### **Description**

Ground covers are plants that naturally grow very close together, causing severe competition for space, nutrients, and water. They are used to stabilize disturbed areas by establishing vegetative cover with trees, shrubs, or vines. The purpose of ground cover is to aid in stabilizing soil in areas where vegetation other than turf is preferred and provides food and shelter for wildlife where wildlife habitat is desirable.

Ground cover should be used under the following conditions:

- 1. On steep or rocky slopes, where moving is not feasible.
- 2. In shady areas where turf maintenance is difficult.
- 3. Where woody plants are desirable for soil conservation and the establishment of wildlife habitat.

#### **Planning Considerations**

- 1. Protect the area from excess runoff as necessary with diversions, grass waterways or sediment basins.
- 2. Evaluate the capabilities and limitations of the soil to be planted. Special attention should be placed on soil pH, texture, internal water movement, steepness, and stability in order to plan the appropriate treatment.
- 3. The species and type of plant selected should be based on soil type, planned use of the area, and the amount of maintenance that can be devoted to the area in the future.
- 4. Fertilizer, lime, seedbed preparation, and irrigation should be used as necessary to promote guick establishment.
- 5. Plantings cannot be expected to provide erosion control and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.

#### **Specifications**

#### a) Planting Time:

Planting should be done in early spring if possible, but no later than May 1, for bare root stock. This allows for the maximum root and top development to reduce soil erosion and allow the plant to become established before winter.

#### (b) Soil Preparation

1. For short slopes, small areas, and mass plantings of close spacing apply a commercial granular fertilizer, such as 6-12-12, and organic supplement, such as composted cow manure, peat, or well-rotted sawdust, and work into the soil prior to planting. Fertilize with 500 pounds per acre. The organic material needed will

depend upon the soil and plant being used. Plants such as pachysandras require a high rate of organic material, about a 2-inch layer worked into the root zone. Depending on the type and steepness of slope, the depth of soil preparation will vary from 4 to 6 inches.

2. For steep slopes and large area plantings, working up the entire planting area would be impractical and would probably induce erosion. Center hole planting, a hole dug for each plant, would be more desirable. If the soil on the slope is poorly suited to the species being planted, incorporate organic material into the slanting hole. Whether organic material is needed or not, fertilize each plant at the rate of one ounce per plant of a complete fertilizer such as 6-12-12. Mix fertilizer with soil below the roots of the plants or place a slow-release pellet or packet in bottom of planting hole.

#### c) Planting

- 1. Select the desired type and species of plants based on the suitability of the soil, the planned use, and the characteristics of the site.
- 2. Soil for ground covers should be well prepared. A well-drained soil high in organic matter is best. If the area to be planted is so large that adding amendments to the soil as a whole would be impractical, organic matter may be added only to each planting hole.
- 3. Plants such as ivy, pachysandra, and periwinkle should be planted on one-foot centers; large plants such as juniper can be spaced on three-foot centers.
- 4. The soil between trees and shrubs must be planted with cover vegetation or must be mulched. When establishing ground covers, it is not desirable to plant species that will make maintenance difficult. A thick durable mulch such as shredded bark or wood chips is recommended to prevent erosion and reduce weed problems. Preemergent herbicides may be necessary where weeding is not practical.
- 5. On slopes where erosion may be a problem, jute net or excelsior blankets may be installed prior to planting, and plants tucked into the soil through slits in the net. Such plants should be put in a staggered pattern to minimize erosion.

#### d) Establishment

- Some watering, weeding, remulching, and fertilizing may be required of a new planting during the period of establishment. Soil movement is not recommended. This could cause soil erosion and/or root injury. Competing weeds should be controlled.
- 2. If a controlled-release fertilizer was used at the time of planting, additional fertilizing will not be necessary for several years. Otherwise, fertilize plantings in the spring of the second growing season and thereafter as needed, using 2 to 3 pounds per 100 square feet of a granulated commercial fertilizer such as 6-12-12.

3. Trim old growth as needed to improve the appearance of ground covers. Most covers need once-a-year trimming to promote growth. Maintain mulch cover with additions of mulch where needed.

### **Riprap**

#### **Description**

Riprap is a permanent, erosion-resistant ground cover of large, loose, angular stone (see Figures 3 and 4).

The purpose of riprap is:

- 1. To protect the soil surface from the erosive forces of concentrated runoff.
- 2. To slow the velocity of concentrated runoff while enhancing the potential for infiltration.
- 3. To stabilize slopes with seepage problems and/or non-cohesive soils.
- 4. Riprap shall have geotextile fabric under the stone.

Riprap may be used, as appropriate, at stormdrain outlets, on channel banks and/or bottoms, roadside ditches, drop structures, at the toe of slopes, etc.

#### **Planning Considerations**

Riprap is classified as either graded or uniform. A sample of graded riprap would contain a mixture of stones that vary in size from small to large. A sample of uniform riprap would contain stones that are all fairly close in size. For most applications, graded riprap is preferred to uniform riprap. Graded riprap forms a flexible self-healing cover, while uniform riprap is more rigid and cannot withstand movement of the stones. Graded riprap is cheaper to install, requiring only that the stones be dumped so that they remain in a well-graded mass. Hand or mechanical placement of individual stones is limited to that necessary to achieve the proper thickness and line.

Uniform riprap requires placement in a more or less uniform pattern, requiring more hand or mechanical labor. Riprap sizes can be designated by either the diameter or the weight of the stones. It is often misleading to think of riprap in terms of diameter, since the stones should be rectangular instead of spherical. However, it is simpler to specify the diameter of an equivalent size of spherical stone. Table 2 list some typical stones by weight, spherical diameter and the corresponding rectangular dimensions. These stone sizes are based upon an assumed specific weight of 165 pounds/ft<sup>3</sup>.

Since graded riprap consists of a variety of stone sizes, a method is needed to specify the size range of the mixture of stone. This is done by specifying a diameter of stone in the mixture for which some percentage, by weight, will be smaller. For example,  $d_{85}$  refers to a mixture of stones in which 85 percent of the stone by weight would be smaller than the diameter specified. Most designs are based on  $d_{50}$ . In other words, the design is based on the median size of stone in the mixture.

Table 2. Size of riprap stones

Section: Appendix DD

Weight (pounds)	Diameter (feet)	Length (feet)	Width, Height (feet)
50	0.8	1.4	0.5
100	1.1	1.75	0.6
150	1.3	2.0	0.67
300	1.6	2.6	0.9
500	1.9	3.0	1.0
1000	2.2	3.7	1.25

Since riprap is used where erosion potential is high, construction must be sequenced so that the riprap is put in place with the minimum possible delay. Disturbance of areas where riprap is to be placed should be undertaken only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap should be placed before or in conjunction with the construction of the pipe or channel so that it is in place when the pipe or channel begins to operate.

#### **Specifications**

- 1. The riprap shall be composed of a well-graded mixture down to the one-inch size particle such that 50 percent of the mixture by weight shall be larger than the  $d_{50}$  size as determined from the design procedure. A well-graded mixture as used herein is defined as a mixture composed primarily of the larger stone size with a sufficient mixture of other sizes to fill the progressively smaller voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the  $d_{50}$  size.
- 2. The site manager, after determining the riprap size that will be stable under the flow conditions shall consider that size to be a minimum size and then, based on riprap gradations actually available in the area, selects the size or sizes that equal or exceed the minimum size.
- 3. The minimum thickness of the riprap layer shall be 1.5 times the maximum stone diameter but not less than 6 inches.
- 4. Stone for riprap shall consist of clean or washed field stone or rough unhewn quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering. The specific gravity of the individual stones shall be at least 2.5.
- 5. Riprap for channel stabilization shall be designed to be stable for the condition of bank-full flow in the reach of channel being stabilized. Riprap shall extend up the

banks of the channel to a height equal to the maximum depth of flow or to a point where vegetation can be established to adequately protect the channel.

#### **Maintenance**

Once a riprap installation has been completed, it should require very little maintenance. It should, however, be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone. If repairs are needed, they should be accomplished immediately.

**Return to Table of Contents** 

#### CHAPTER 4I-RECLAMATION

Upon completion of borrow activities, the site should be brought to the desired final grade and stockpiled topsoil should be applied. Final contours should resemble original contours as closely as possible with slopes not to exceed 2:1. Measures should be taken to provide permanent ground cover through seeding or sprigging. Temporary erosion controls should be removed after establishment of permanent ground cover.

### **Topsoil Application**

After the application of the topsoil to such a depth as needed, the area shall be harrowed and disked entirely through the layer of topsoil and into the subsoil to a depth of at least 2 inches in order to secure proper bond of the topsoil with the subsoil. At this stage all large lumps, large rocks, roots, or other objectionable matter shall be gathered up and disposed. On such areas where the application of topsoil involves primarily the backfilling of rills or small washes, ground preparation may be delayed until just before the application of fertilizer and grassing operations.

## **Permanent Seeding**

#### Description

Permanent seeding is the establishment of permanent vegetation on disturbed areas by planting seed. The purpose of permanent seeding is to reduce erosion and decrease sediment yield from disturbed areas and stabilize disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant materials.

Permanent seeding should be applied to disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil and rough graded areas that will not be brought to final grade for several months or more.

#### **Planning Considerations**

- 1. Protect the area from excess runoff as necessary with diversions, waterways, or sediment basins.
- 2. Evaluate the capabilities and limitations of the soil to be seeded. Special attention needs to be given to soil pH, texture, internal water movement, steepness, and stability in order to plan the appropriate treatment.
- 3. Plant species should be selected on the basis of timing of establishment, planned use of the area, and the amount or degree of maintenance that can be devoted to the area in the future.
- 4. Fertilizer, lime, seedbed preparation, seed coverage, mulch, and irrigation should be used as necessary to promote quick plant growth.

#### **Specifications**

#### a) Site Preparation

- 1. Soil materials should be capable of supporting permanent vegetation and have at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of porous sand will not consistently provide sufficient moisture for good growth regardless of other soil factors.
- 2. Where compacted soils occur, they should be broken up sufficiently to create a favorable rooting depth of 6-8 inches.
- 3. Stockpile topsoil to apply to sites that are otherwise unsuited for establishing vegetation.
- 4. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring, and maintenance. After the grading operation, spread topsoil where needed.
- 5. Install the needed erosion control practices such as diversions, waterways, and sediment basins.

#### b) Seedbed Preparation

The seedbed is prepared using the same guidelines detailed in Chapter 3, C (Soil Stabilization Measures).

#### c) Seed Application

After seedbed preparation, seed may be applied by drilling, broadcasting or hand application. All broadcast seed shall have straw mulch placed over the area to promote

water retention, soil stabilization and seed germination. All seeding on slopes will be covered with straw mulch and crimped in use dozer track or disk harrow running cross slope. This will provide adequate stabilization to the slopes until seed germination can occur.

#### Maintenance

Maintenance is a vital factor in maintaining an adequate vegetative erosion control cover.

- <u>Irrigation</u> If soil moisture is deficient, supply new seedings with adequate water for plant growth until they are firmly established. This is especially true when seedings are made late in the planting season, in abnormally dry and hot season, or on adverse sites.
- Repairs Inspect all seeded areas for failures and make necessary repairs, replacements, reseedings, and remulching within the planting season.
  - 1. If stand is inadequate, (less than 85 percent groundcover) overseed, fertilize, using half of rates originally applied, and mulch.
  - 2. If stand is more than 60 percent damaged, reestablish following original seedbed preparation methods, seeding and mulching recommendations and apply lime and fertilizer as needed according to a soil test.

	•	•
Permanent Plant Mixtures	Application Rate Per Acre	Plant Dates
Tall Fescue	45 Pounds	Feb. 15 - Apr. 15
White Clover	3 Pounds	Sep. 15 - Oct. 15
Crownvetch	20 Pounds	Feb. 15 - Apr. 15
Tall Fescue	30 Pounds	Aug. 15 - Oct. 15
Korean or Kobe	8 Pounds	Mar. 1 - May 15
Lespedeza		Aug 15 – Oct 15
Warm Season Grasses	3 – 7 pounds	May 1 – Sep 30

**Table 3.** Guidelines for selecting permanent seeding

## **Hydroseeding**

#### **Description**

Hydroseeding is the application of seed, fertilizer, necessary organic soil amendments, fiberous mulch, and a tachifier. The products are applied as a single, uniformly applied, sprayed slurry under pressure over the entire area.

Page 875 of 947

#### **Specifications**

Section: Appendix DD

#### a) Seed Classification.

State approved seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws.

#### b) Seed Mixtures.

Seed will be applied at a rate of 45 lbs per acre and shall be proportioned by weight as follows:

<u>Mixture Percen</u>	<u>t by Weight</u>
edeza	10%
	8%
, Fungus Free	82%
	edeza

#### c) Fertilizer.

Fertilizer shall be commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909. Granular Fertilizer shall be applied at a rate of 500 lbs per acre with a guaranteed analysis of 6-12-12.

#### d) Wood Cellulose Fiber Mulch.

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate visual metering during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

#### e) Tachifier.

A biodegradable tachifier shall be applied at a rate of 100 lbs per acre.

#### f) Seeding Time.

The hydroseeding operation should be conducted from 15 February to 1 May to obtain the best results.

#### G) Tillage.

Soil on slopes gentler than 3-horizontal-to-1-vertical shall be tilled to a minimum depth of four inches. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum depth of 2 inches by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required.

#### h) Final Grade Preparation.

Turf areas shall be filled as needed or have surplus soil removed to attain the finished grade. Drainage patterns shall be maintained as indicated on drawings. Turf areas compacted by construction operations shall be completely pulverized by tillage. Soil

used for repair of erosion or grade deficiencies shall conform to topsoil requirements specified by the grading requirements. Finished grade shall be 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas.

i) Satisfactory Stand of Turf.

A satisfactory stand of turf from the seeding operation is defined as a minimum of 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

#### **Maintenance During Establishment Period**

Maintenance of the turfed areas shall include eradicating weeds, eradicating insects and diseases, protecting embankments and ditches from erosion, maintaining erosion control materials and mulch, protecting turfed areas from traffic, mowing, watering, and post-fertilization.

#### **Return to Table of Contents**

#### REFERENCES

Kentucky Division of Conservation and Division of Water. August 1994. <u>Kentucky Best Management Practices for Construction Activities</u>. Kentucky Division of Conservation and Division of Water.

Tennessee Department of Environment and Conservation. July 1992. <u>Tennessee</u> <u>Erosion & Sediment Control Handbook: A Guide for Protection of State Waters through Effective Management Practices during Construction Activities</u>. Tennessee Department of Environment and Conservation.

**Return to Table of Contents** 

## IMCB-PWE Borrow/Spoil Permit

Contract#		
Contractor:		
Vehicle Tag #		_
Material: Borrow	Spoil	
Material Type: Topsoil	Fill	
Dates of Excavation:		
Quantity to be moved:		
Authorized by		
Date:		
Signature		

Section: Appendix DD

**Return to Table of Contents** 

#### APPENDIX J

#### Installation of ICIDS Equipment in Arms Rooms / COMSEC Vaults

This version supersedes all other ICIDS Instructions prior to 14 June 2011

**First Priority** in ICIDS installation is the contractor scheduling a meeting with the ICIDS Administrator, Mr. Anthony Saylor, and Senior Technician, Mr. Bennie Robinson, prior to commencement of work.

**Second** Priority in ICIDS installation is the contractor scheduling an inspection of the conduit and wire prior to closing up the walls/ceiling.

**NOTE:** Type and placement of ICIDS sensors will be discussed at the meeting.

Contact information is: Office: (270) 412-5864 or (270) 798-1225, Cell Phone: (931) 624-1783, or email at: <a href="mailto:anthony.saylor@us.army.mil">anthony.saylor@us.army.mil</a>

- Contractor will run and tag all wire and provide all materials except as noted.
- Contractor will provide the ICIDS Administrator the Asbuilts to the ICIDS protected area(s) during the inspection of the conduit and wiring.
- 1. Mount the Remote Area Data Collector (RADC) to the same side as the interior door opens, approximately two feet to the left or right of the door and five feet up from the floor.

(RADC provided by ICIDS Administrator.)

2. Foursquares for sensors must be mounted according to the attached diagram, depending on room size. Half inch EMT must be run from the foursquares to the RADC can (top).

(Note: Placement of sensors will be noted at time of meeting. See arms room type drawings 1, 2, or 3 (depending on the size of the room, attached). The four squares for the ceiling sensors must be flushed with the dropped ceiling. If Sharpshooters are utilized in the plan, the foursquares must be flushed against a flat wall just above the drop ceiling.

- 3. Mount a foursquare box approximately 18 inches above and centered, on inside of protected room arms room door, and run half inch EMT from box to RADC can (top).
- 4. Dedicated 120 Volt AC power with minimum of a 20 AMP (30 AMP preferred) Breaker must be run to RADC can through ½" or ¾" EMT. The Line must be tagged.

- 5. A four conductor 22 awg wire must be run from motion sensor to RADC. The wire must be tagged. (Motion sensors provided by ICIDS Administrator.)
- 6. A two conductor 22 awg wire must be run from foursquare above arms room door to RADC. This is for the Balance Magnetic Switch (BMS) for the door. The wire must be tagged.

(BMS provided by ICIDS Administrator.)

#### NOTES:

#1: All conduits going into the RADC must be flushed on the inside of the can.

#2: All holes drilled into the RADC can, to run wires, must be sealed off with no metal showing; There are marked areas in the RADC can that can be used. If new holes are drilled they must be drilled in such a way that the inside parts of the RADC must be attached unhindered.

#3: The AC power lines leading to the inside of the can CANNOT be in the center of the can.

#4: Leave approximately four feet of wire at both ends. All Wire must be Single Stranded solid copper.

#5: For new buildings with ICIDS requirements and rooms other than arms room, the ICIDS Administrator will instruct the electrician where to run the wires and mount the four square box.

#6: All four square boxes must have covers.

#7: Measurements: RADC: Approximately 5 to 5 ½ feet above floor and two feet left of door.

Keypad: Approximately 4 ½ to 5 feet above floor and one foot left of door.

#8: Wire Type: West Penn 220 = 2 conductor 22 awg (product manufacture can be substituted)

West Penn 240 = 4 conductor 22 awg (product manufacture can be substituted)

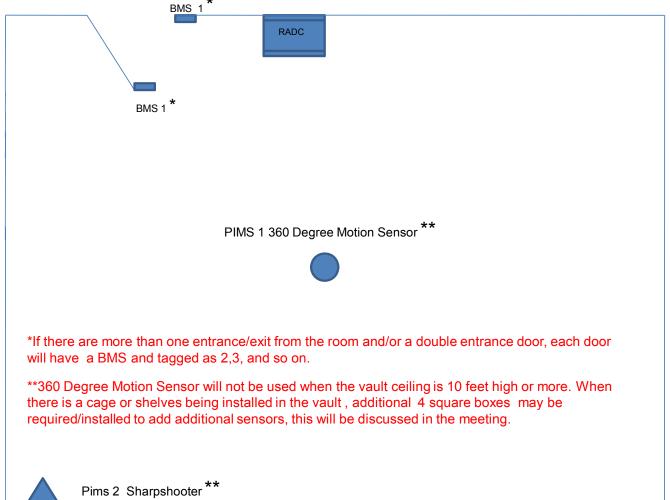
# 9: Power: Black, Red, Green 12 awg stranded to RADC

#7: Measurements: RADC: Approximately 5 to 5 ½ feet above floor and two feet left of door. Keypad: Approximately 4 ½ to 5 feet above floor and one foot left of door.

#8: Wire Type: West Penn 220 = 2 conductor 22 awg (product manufacture can be substituted). West Penn 240 = 4 conductor 22 awg (product manufacture can be substituted)

# 9: Power: Black, Red, Green 12 awg stranded to RADC

## LED centered above door (outside) Small Arms Room/COMSEC Vault

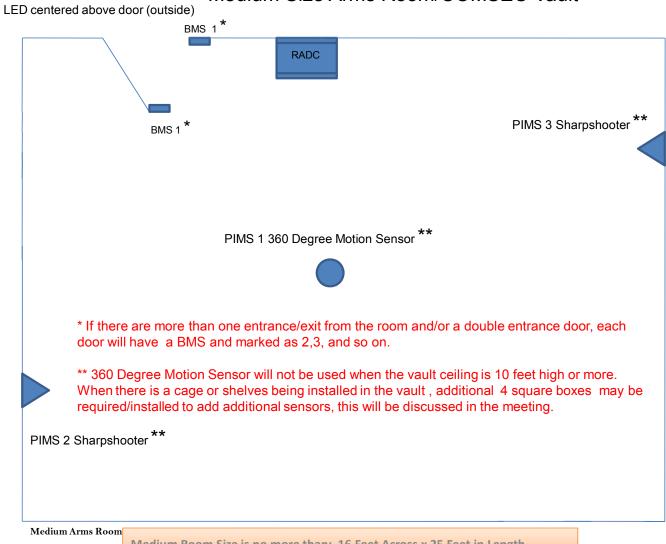


Small Arms Room 1

6/17/2011

Small Room Size is no more than: 13 Feet Across x 20 Feet in Length

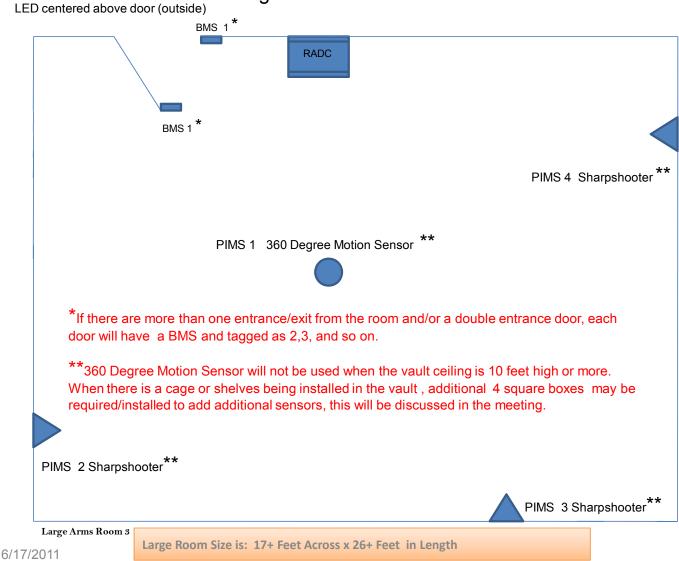
## Medium Size Arms Room/COMSEC Vault



6/17/2011

Medium Room Size is no more than: 16 Feet Across x 25 Feet in Length

## Large Size Arms Room/COMSEC Vault



## APPENDIX K

Section: Appendix DD

#### **Refuse Container Enclosures**

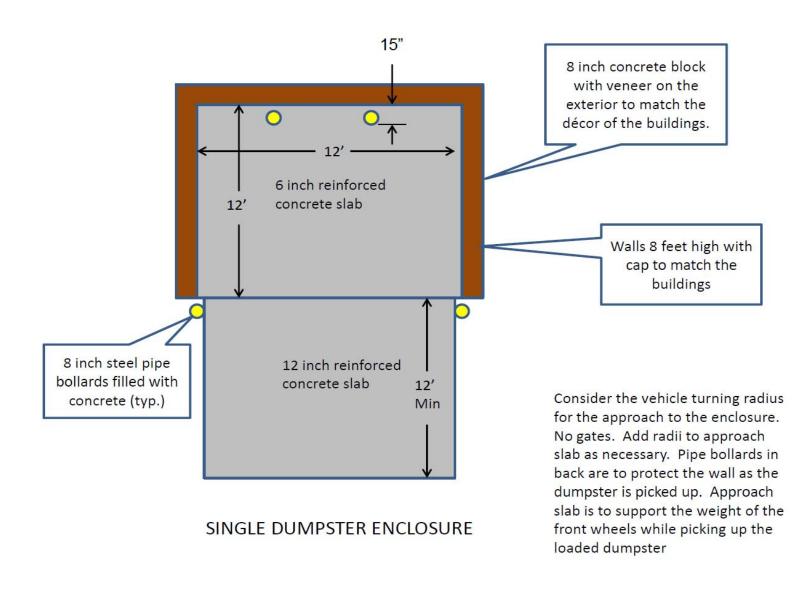


Figure K-1

# APPENDIX K

Section: Appendix DD

## Refuse Container Enclosures (con't)

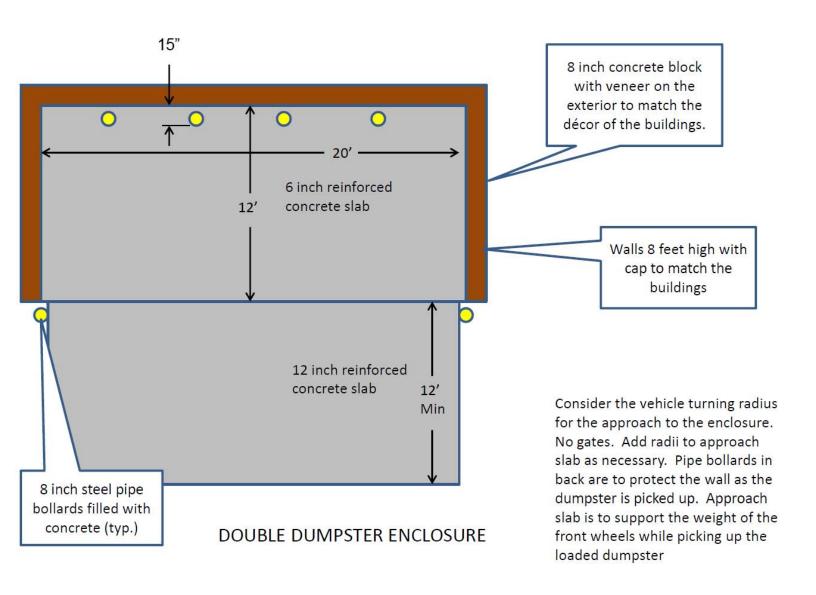


Figure K-2

# APPENDIX K

Section: Appendix DD

## **Refuse Container Enclosures (con't)**

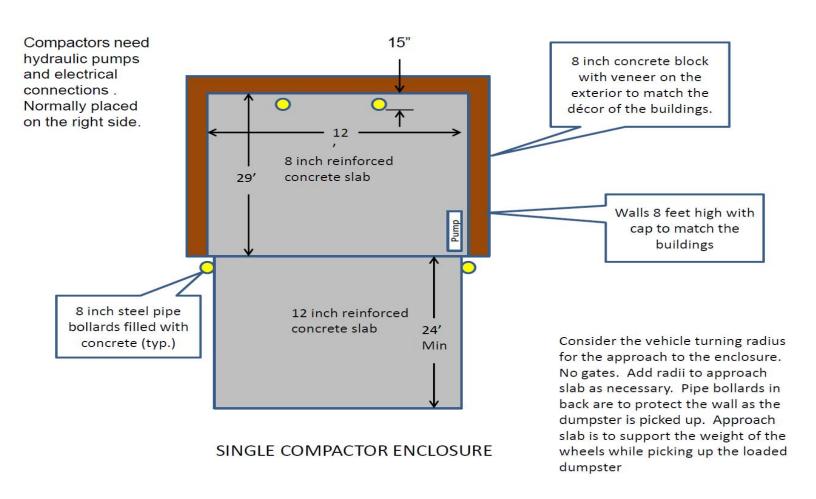


Figure K-3

#### APPENDIX K

### Refuse Container Enclosures (con't)

The three figures show the approximate shape of the dumpster and compactor enclosures. For multiple dumpsters, add 10 feet of width for each additional dumpster. For compactors add 12 feet of width for each additional compactor. For additional dumpsters or compactors add two bollards in the rear of the enclosure. The slab should be designed for the weight of the vehicle (refuse collection truck or roll off container truck with the dumpster or compactor. There are no open top large refuse or recycle dumpsters used by the Fort Campbell Refuse Contract other than at the convenience center. Pipe bollards must be yellow in color for safety. The interior of the enclosure should be painted to match the décor of the project.





US Army Corps Of Engineers® Engineering and Support Center, Huntsville

### **PROJECT TITLE:**

VALUE ENGINEERING STUDY on the STANDARD DESIGN for the CENTER OF STANDARDIZATION LIVE FIRE SHOOTHOUSE.

Date of Report: 14 May 2012

Prepared by:

Tiffany W. Torres

#### VALUE ENGINEERING TEAM STUDY

DOD SERVICE: USACE

CONTROL NO: HNC-FY12-001

VALUE ENGINEERING OFFICER: Tiffany W. Torres

## Value Engineering Study on the

## Standard Design for the Center of Standardization (CoS) Live Fire Shoothouse

HNC-FY12-001

April 2012
U.S. Army Corps of Engineer, Huntsville Center

#### **VALUE ENGINEERING STUDY TEAM LEADER:**

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#### **VALUE ENGINEERING STUDY TEAM MEMBERS**

Robert Jackson II Mark McDonald

Chris Shepherd Jackie White

Todd Wood, EIT

# VALUE ENGINEERING TEAM STUDY TABLE OF CONTENTS

	Page No
Introduction	4
Executive Summary	7
Function Analysis Phase	8
Creative Phase	9
Summary of Proposals	10
Proposals:	
Combine Latrine with AAR Building	11
Utilize Solar Power for AAR and Ops Storage Facility	13
Utilize Solar Power for Latrine	16
Spectrally Enhance Lighting	19
Use LED Lighting for Outside Lighting	22
Delete Electrical Room of Shoothouse and Add Outdoor Panels	25
Add Ventilation to the Roof of Shoothouse	27
Comments	29
Supporting Documents	30
Appendix A: Contact Directory	31
Appendix B: VE Workshop Agenda	33
Appendix C: Speculation Sheet	35
Appendix D: Back-up Information	37

Section: Appendix EE

#### VALUE ENGINEERING TEAM STUDY

#### PROJECT DESCRIPTION AND BACKGROUND

PROJECT TITLE: VE Study CoS Live Fire Shoothouse Standard Design

PROJECT LOCATION: Various Locations

#### Introduction:

The purpose of this project is to perform a Value Engineering (VE) study on the standard design of the Center of Standardization (CoS) Live Fire Exercise Shoothouse (LFSH). The LFSH provides the Commander with a facility to train and evaluate the unit during a live fire exercise. Units are trained and evaluated on their ability to move tactically (enter and clear a room; enter and clear a building), engage targets, conduct breaches and practice target discrimination.

The shoothouse is intended to support blank fire, Multiple Integrated Laser Engagement System/Tactical Engagement System (MILES/TES), Special Effects Small-Arms Marking System (SESAMS), and installation approved small arms service ammunitions.

The standard shoothouse includes a minimum net training space of approximately 158 square meters (1700sf). The actual size of the facility depends on the thickness of the bullet absorbing material chosen. The standard depicts 610mm (24") thick walls. The gross area of the shoothouse should be kept to a maximum of 232 square meters (2500sf). The shoothouse cover should be kept to a maximum of 418 square meters (4500sf).

The standard shoothouse has eight rooms and two corridors. Included in the design are four entrances/exits. Also included are four breech holes, one exterior and three interior, used for dynamic entry methods.

The shoothouse must be designed to accommodate the types of mechanical and explosive breaching techniques that will be used. The layout of the rooms may be changed from the standard in order to support a units particular training tasks.

The shoothouse must provide a means of stopping and containing rounds exiting through the exterior doors and blow holes in the shoothouse. This may be done using additional bullet absorbing wall material, earth berms, or other method.

The shoothouse is not designed for live fragmentation/concussion grenades.

The electrical closet and catwalk should be designed so they are not supported by the shoothouse walls to allow panel replacement.













## VALUE ENGINEERING TEAM STUDY EXECUTIVE SUMMARY

The Value Engineering Study was conducted at Huntsville Center on 9-11 April 2012. The VE team was comprised of a representative from the following disciplines: Mechanical, Electrical, Architecture, and Cost. See Appendix A for the VE team roster and listing of all attendees.

Value Engineering (VE) is a process used to study the functions a project is to achieve. VE takes a critical look at how these functions are proposed to be met and it identifies alternative ways to achieve the equivalent function while increasing the value and the benefit-cost ratio of the project. In the end, it is hoped that the project will realize a reduction in cost, but increased value is the focus of the process, rather than simply reducing cost. The Corps of Engineers standard Value Engineering (VE) methodology, consisting of six phases:

<u>Information Phase</u>: The basic objectives of the Information phase are to obtain a thorough understanding of the item under study and to define the problem by means of function descriptions.

<u>Function Analysis Phase</u>: The objective of the Function Analysis Phase is to determine the function(s) of the project and its parts; what *must* it do (basic function)? What *does* it do? What *else* does it do (secondary function)? Value methods such as Random Function Definition, FAST diagramming, and Function logic are tools often used during this phase.

<u>Creative Phase</u>: This phase is often referred to as brainstorming. The objective of this phase is to generate alternative means to accomplish the basic function. Creativity and a free flow of ideas – without criticism – is required from all VEST members.

<u>Evaluation Phase:</u> The objective of the Evaluation phase is to evaluate ideas and concepts generated during the Creative phase and select feasible ideas for development into specific value improvements. Ideas are typically ranked and rated using evaluation criteria and team consensus. There are several options for ranking alternatives.

<u>Development Phase</u>: The objective of the Development phase is to develop the Value Engineering proposals. The generated ideas were developed into written proposals by VE team members and are included in this report. Additional VE Team Comments were also included for items of interest that were not developed as proposals, and these comments follow the study proposals.

<u>Presentation Phase</u>: The objective of the Presentation phase is to present the Value Engineering study report to the decision-makers.

## VALUE ENGINEERING TEAM STUDY FUNCTION ANALYSIS PHASE

Having gained some information on the project, the VE Team proceeded to define the functions of the Shoothouse, and the additional buildings included in the standard design package (After Action Review (AAR) Building, Latrine, Operations Storage Building, etc.).

The objective of the function analysis phase is to determine the function(s) of the project and it's parts; what must it do (basic function)? What does it do? What else does it do (secondary function)? Function is defined as the intended use of a physical or process element.

The team attempted to identify the functions of the complex of buildings that make up the Live Fire Shoothouse standard design in the simplest manner using an active verb/measurable noun word pairing. The active verb answers the question "What does it do?" and defines the item's required action (i.e. generate, control, pump, emit, protect, transmit, etc.). The measurable noun answers the question "What does it do it to?" and defines what is acted upon (i.e. electricity, temperature, liquids, light, surfaces, people, sound, etc.).

The following functions were identified and referenced during the creative phase:

VERB	NOUN TYPE		
Train	Soldiers	Higher Order	
Support	Blank fire	Basic	
Observe	Trainee	Basic	
Support	Small arms	Basic	
Analyze	Training	Secondary	
Store	Equipment	Secondary	
Issue	Ammunition	Secondary	
Record	Training	Basic	
Support	Soldiers	Secondary	
Support	Hygiene	Secondary	

## VALUE ENGINEERING TEAM STUDY CREATIVE PHASE

This phase is often referred to as brainstorming. The objective of this phase is to generate alternative means to accomplish the basic function. Creativity and free flow of ideas, without criticism, is required from all VE team members. Innovative ideas for improving the functionality of the design, while maintaining or increasing the quality were encouraged. At this stage of the process, the VE team was looking for a large quantity of ideas.

The following are all of the ideas that were generated during the Creative Phase:

Combine Latrine with AAR Building	Υ
Consider Enclosing Entire Facility to Minimize Sound Pollution	N
Utilize Solar Power for AAR and Ops Storage Facility	Υ
Utilize Solar Power for Latrine	Υ
Relocate Compressor in Latrine to Attic or Outside to Minimize Sound	N
Spectrally Enhance Lighting	Υ
Use LED Lighting for Outside Lighting	Υ
Lower Elevation of Shoothouse Roof	N
Bring all Electrical Rooms up to Code (NEC)	N
Remove Light Dimming Requirement	N
Delete Electrical Room of Shoothouse and Add Outdoor Panels	Υ
Provide Pole-mounted Transformers Instead of Pad-mounted	N
Run Electrical Primary Aerial Instead of Underground	N
Consider Adding Panels to Walls to Reduce Sound	N
Add Ventilation to the Roof of Shoothouse	Υ
Consider Installing a Thermostat for Unoccupied Setback in Connection with Lights or an Occupancy Sensory	N
Cool Roof	N
·	

#### Legend:

Y = Yes, consider for proposal development

N = Should not be considered for proposal development, add comment instead

For the complete brainstorming worksheet, refer to Appendix C.

#### Section: Appendix EE

# VALUE ENGINEERING TEAM STUDY SUMMARY OF DEVELOPED PROPOSALS

Proposal #	Description	Total Cost Savings	Total Life Cycle Cost Savings	Accepted (Y/N)	Comments
1	Combine Latrine with AAR Building	\$8,736			
2	Utilize Solar Power for AAR and Ops Storage Facility	-\$6,075			
3	Utilize Solar Power for Latrine	\$10,235			
4	Spectrally Enhanced Lighting	\$880			
5	Use LED Lighting for Outside Lighting	\$39			
6	Delete Electrical Room of Shoothouse and Add Outdoor Panels	\$2,853			
7	Add Ventilation to the Roof of Shoothouse	-\$433			
Total		\$16235			

Section: Appendix EE

#### VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 1 PAGE NO: 1 OF 2

DESCRIPTION: Combine Latrine with AAR Building

#### ORIGINAL DESIGN:

The existing design has the AAR Building and the Latrine as two separate buildings in close proximity to be unitized by all soldiers and staff training at the Shoot House.

#### PROPOSED DESIGN:

Combine the AAR building with the Latrine to create one building.

#### **ADVANTAGES**:

- 1. Reduce the cost of construction
- 2. Decrease energy cost
- 3. Increase quality of life

#### **DISADVANTAGES:**

- 1. Noise from the compressor in latrine
- 2. Smell from latrine

#### JUSTIFICATION:

By combining the AAR Building with the Latrine, this will save construction cost. This will also increase the quality of life for the soldiers, due to the time spent in the AAR Building. The construction cost for building the roof, walls and electrical system will be reduced by only building one application instead of multiple. This could be considered in final design.

## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 1 PAGE NO: 2 OF 2

DESCRIPTION: Combine Latrine with AAR Building

C	OST ESTIM	ATE WORKSHEET	•	
Speculation Item # 1				
	DE	LETIONS		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Wall	SF	228	\$40.00	\$9,100
				\$0
				\$0
				\$0
		Total Deletions		\$9,100
	AD	DITIONS		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Design Cost		0.04	\$9,100.00	\$364
				\$0
		Total Additions		\$364
		Net Cost Decrease	Э	\$8,736
		Mark-ups	0.00%	\$0
		Total Cost Decrea	se	\$8,736
All Mark-ups included in Unit Pri	ices. Contir	I	ed.	

PROPOSAL NO: 2 PAGE NO: 1 OF 3

DESCRIPTION: Utilize Solar Power for AAR and Ops Storage Facility

#### ORIGINAL DESIGN:

 The original design provides electrical power to the After Action Review (AAR) and Operation Storage Facility (OS).

- The After Action Review Building is provided with a 120/240 power panel. The connected load is 37.9 KVA and the total demand loads are 35.52 KVA and 148 amps.
- The Operation Storage Facility is provided with a 120/240 power panel. The connected load is 10.4 KVA and the total demand loads are 8.1 KVA and 33.4 amps.

#### PROPOSED DESIGN:

The proposed design is to power the After Action Review and Operation Storage Facility with solar power.

- Maximum energy needed for the AAR at any one time (30,320 watts)
- Maximum daily power requirements for AAR (303.2 kilowatt-hours)
- Maximum energy needed for the OS at any one time (8,320 watts)
- Maximum daily power requirements for OS (83.2 kilowatt-hours)

#### **ADVANTAGES**:

- Remote Power. PV arrays can stand alone to provide intermittent power for remote applications, or be coupled battery storage systems to deliver around the clock power for remote applications.
- Energy Security: Solar energy is natural and renewable. The energy source is found in abundance across the U.S. and can be leveraged to increase energy continuity.
- Photovoltaic systems require very little maintenance. Most small PV systems take no more than 2 to 4 hours per year to maintain.

PROPOSAL NO: 2 PAGE NO: 2 OF 3

DESCRIPTION: Utilize Solar Power for AAR and Ops Storage Facility

#### **DISADVANTAGES**:

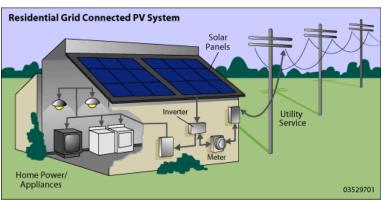
PV systems generate electricity and are not appropriate for mechanical or thermal power.

PV arrays must be connected to energy storage or backup equipment to provide electricity when sunlight is not available (e.g., evenings).

#### **JUSTIFICATION:**

Regulatory Requirements: Electricity produced by solar energy falls under the Energy Policy Act (EPAct) of 2005 definition of renewable energy and can be used to meet EPAct 2005 renewable energy requirements





## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 2 PAGE NO: 3 OF 3

DESCRIPTION: Utilize Solar Power for AAR and Ops Storage Facility

C	OST ESTIN	MATE WORKSHEE	Γ	
Speculation Item # 2				
	DE	LETIONS		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
				\$0
				\$0
				\$0
		Total Deletions		\$0
	AI	DDITIONS		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Solar panels	SF	180	\$33.75	\$6,075
				\$0
				\$0
		Total Additions		\$0
		Total Additions		\$6,075
		Net Cost Decrease	е	-\$6,075
		Mark-ups	0.00%	\$0
		Total Cost Decrea	se	-\$6,075
All Mark-ups included in Unit Pr	ices. Conti	l ngency or S&I applic	ed.	

PROPOSAL NO: 3 PAGE NO: 16 OF 3

DESCRIPTION: Utilize Solar Power for Latrine

#### **ORIGINAL DESIGN**:

The original design provides an electrical power to the Latrine. The Latrine is provided with a 120/240 power panel. The connected load is 3325 VA and the total demand loads are 3,325 VA and 14 amps.

#### PROPOSED DESIGN:

The proposed design is to power the Latrine with solar power.

- Maximum energy needed at any one time (3360 watts)
- Maximum daily power requirements (33.6 kilowatt-hours)

#### **ADVANTAGES**:

- Remote Power. PV arrays can stand alone to provide intermittent power for remote applications, or be coupled battery storage systems to deliver around the clock power for remote applications.
- *Energy Security*: Solar energy is natural and renewable. The energy source is found in abundance across the U.S. and can be leveraged to increase energy continuity.
- Photovoltaic systems require very little maintenance. Most small PV systems take no more than 2 to 4 hours per year to maintain.

#### **DISADVANTAGES**:

PV systems generate electricity and are not appropriate for mechanical or thermal power.

PV arrays must be connected to energy storage or backup equipment to provide electricity when sunlight is not available (e.g., evenings).

## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 3 PAGE NO: 2 OF 3

DESCRIPTION: Utilize Solar Power for Latrine

#### **JUSTIFICATION:**

Regulatory Requirements: Electricity produced by solar energy falls under the Energy Policy Act (EPAct) of 2005 definition of renewable energy and can be used to meet EPAct 2005 renewable energy requirements.

## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 3 PAGE NO: 3 OF 3

DESCRIPTION: Utilize Solar Power for Latrine

COST ESTIMATE WORKSHEET						
Speculation Item # 3						
	DEL	ETIONS				
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL		
Electrical run to latrine	LF	500	\$32.62	\$16,310		
				\$0		
				\$0		
				\$0		
		Total Deletions		\$16,310		
	ADI	DITIONS				
177.4	LINUTO	OLIANITITY	LINUT COOT	TOTAL		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL		
Solar panels	SF	180	\$33.75	\$6,075		
				\$0		
				\$0		
		Tatal Additions		\$0 \$0.075		
		Total Additions		\$6,075		
		Net Cost Decreas	20	¢10.225		
			0.00%	\$10,235		
		Mark-ups Total Cost Decre		\$0 \$10,235		
		Total Cost Decre	ase	Φ10,233		
All Mark-ups included in Unit Pric	es Continu	nency or S&I applie	ad			
All Mark-ups included in Offit Price	es. Contin		su.			
	1					

PROPOSAL NO: 4 PAGE NO: 1 OF 3

**DESCRIPTION: Spectrally Enhanced Lighting** 

#### ORIGINAL DESIGN:

Conventional practice utilizes lamps with correlated color temperature (CCT) of 3000K to 4100K

#### PROPOSED DESIGN:

Provide spectrally enhanced lighting. Use lamps with a correlated color temperature of 5000K or higher.

Energy savings are achieved by using fewer lamps and lower ballast factor.

#### **ADVANTAGES**:

- The eye is more sensitive to light in the higher CCT range (bluer, closer to the color of natural sunlight).
- Spectrally Enhanced Lighting (SEL) uses lamps with a CCT 5000K.
- Since eye is more sensitive to light with higher CCT, lower ballast factor ballast can be used to dim the lights which are not apparent to the eye.
- Lamps with an enhanced color spectrum in higher color temperature ranges (more blue), allow people to see more clearly and make spaces appear brighter.
- Light levels are reduced with the same visual acuity.

#### **DISADVANTAGES:**

None

#### JUSTIFICATION:

 DOE studies show a 20% - 45% reduction in power with the same occupant satisfaction

## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 4 PAGE NO: 2 OF 3

DESCRIPTION: Spectrally Enhanced Lighting

Facility	No. Fixtures	Symbols
Latrine	3	С
	2	В
Operation and Storage	4	BE
	8	В
	2	С
	2	DW
	12	D
Ammo Breakdown	10	K
After Action Review	4	FE
	6	F
	3	DW
	3	С
	3	L

See Appendix D – Back-up Information

## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 4 PAGE NO: 3 OF 3

DESCRIPTION: Spectrally Enhanced Lighting

COST ESTIMATE WORKSHEET					
Speculation Item # 4					
DEL	ETIONS				
			UNIT		
ITEM	UNITS	QUANTITY	COST	TOTAL	
Standard lamps				\$555.92	
Fixtures deleted due to enhanced lamps				\$1,052.01	
				\$0	
				\$0	
		Total Deletio	ns	\$1,608	
ADL	ITIONS	<u> </u>			
			UNIT		
ITEM	UNITS	QUANTITY	COST	TOTAL	
Enhanced lamps	OIVITO	QUANTITI	0001	\$728.17	
Zimanood lampo				\$0	
				\$0	
				\$0	
		Total Addition	ns	\$728	
				Ţ. <u>_</u> 0	
		Net Cost Dec	crease	\$880	
		Mark-ups	0.00%	\$0	
		Total Cost Do		\$880	
All Mark-ups included in Unit Prices. Contingen	ency or S	&I applied.			
	-				

PROPOSAL NO: 5 PAGE NO: 1 OF 3

DESCRIPTION: Use LED Lighting for Outside Lighting

#### **ORIGINAL DESIGN:**

Fluorescent lighting was used in the original design.

#### PROPOSED DESIGN:

Provide LED luminaries for outdoor lighting.

#### **ADVANTAGES:**

- Apply where directionality, instant-on, and long-life
- LED outdoor luminaries can provide the required surface luminance using less energy and with improved uniformity, compared to HID sources.
- LED luminaries may also have significantly longer life (50,000 hours or more, compared to 15,000 to 35,000 hours) with better lumen maintenance.
- Other LED advantages include: they contain no mercury, lead, or other known disposal hazards;
- LED luminaries come without run-up time or restrike delay
- LEDs usually do not fail abruptly like traditional light sources; instead their light output slowly diminishes over time.
- LED light sources can have such long lives that life testing and acquiring real
  application data on long-term reliability becomes problematic—new versions of
  products are available before current ones can be fully tested.
- LED light output and useful life are highly dependent on electrical and thermal conditions that are determined by the luminaries and system design

#### **DISADVANTAGES**:

- LEDs are attached to heat sinks to conduct heat away from the device; however,
   no "standard" or "reference" heat sinks exist for LEDs
- LEDs are often integrated permanently into the fixture, making their replacement difficult or impossible

PROPOSAL NO: 5 PAGE NO: 2 OF 3

DESCRIPTION: Use LED Lighting for Outside Lighting

## **JUSTIFICATION:**

Energy Policy Act of 2005 mandates DOE to accelerate Solid State Lighting technology.



## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 5 PAGE NO: 3 OF 3

DESCRIPTION: Use LED Lighting for Outside Lighting

COST ESTIMATE WORKSHEET					
Speculation Item # 5					
	DELETIO	NS			
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL	
Incandescent fixture, exterior	EA	2	\$97.79	\$196	
				\$0	
				\$0	
				\$0	
		Total Deletions		\$196	
	ADDITIO	NS			
ITEM.	LINUTO	OLIANITITY	LINUT COOT	TOTAL	
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL	
LED lamp, 36 watt, 110/220 V	EA	1	\$156.57	\$157	
				\$0 \$0	
				\$0 \$0	
		Total Additions		\$157	
		Total Additions		φ101	
		Net Cost Decre	256	\$39	
		Mark-ups	0.00%	\$0	
		Total Cost Decrease		\$39	
				Ψ30	
All Mark-ups included in Unit Prices.	Contingency	or S&I applied.			

PROPOSAL NO: 6 PAGE NO: 1 OF 2

DESCRIPTION: Delete Electrical Room of Shoot House and Add outdoor Panel

#### **ORIGINAL DESIGN:**

- The Shoot House has an electrical room. It contains a power panel and a data enclosure.
- Fiber Optic Cable routed from the After Action Review Facility is terminated in the data enclosure located in the electrical room.
- Electrical Room adds additional protection for the equipment.

#### PROPOSED DESIGN:

Delete electrical room. The power panel and date enclosure could be placed outdoors in weatherproof enclosures

#### **ADVANTAGES:**

Reduce cost of construction (walls, doors, locks)

#### **DISADVANTAGES:**

Equipment will not be protected from soldiers during training exercises.

#### JUSTIFICATION:

Electrical Room is not needed. By replacing the electrical room of Shoothouse with outdoor electrical panel and case, construction cost will be reduced.





## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 6 PAGE NO: 2 OF 2

DESCRIPTION: Delete Electrical Room of Shoot House and Add outdoor Panel

COST ESTIMATE WORKSHEET				
Speculation Item # 6				
DELE	ETIONS			
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Electrical Room	SF	18	\$198.83	\$3,579
				\$0
				\$0
				\$0
		Total Deletion	าร	\$3,579
ADD	ITIONS	T	<u> </u>	
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Panelboard, 3 phase, 240 V, 100 amp	EA	1	\$725.57	\$726
				\$0
				\$0
				\$0
				\$0
		Total Addition	ns	\$726
		Net Cost Dec		\$2,853
		Mark-ups	0.00%	\$0
		Total Cost De	ecrease	\$2,853
All Mark-ups included in Unit Prices. Continge	ency or S	&I applied.	T	

#### VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 7 PAGE NO: 1 OF

DESCRIPTION: Add Ventilation to the Roof of the Shoothouse

#### **ORIGINAL DESIGN:**

The existing design does not have a system to help exhaust any lead particles/dust that may be suspended in the air.

#### PROPOSED DESIGN:

Add ventilation to the Shoothouse. Include an on/off switch that controls a roof/exhaust fan which ties into two fresh air intake louvers with motorized dampers that closes when not used. The benefit is to help remove lead particles/dust from the space and also for occupant comfort during hot weather conditions (likely in the summertime).

#### ADVANTAGES:

- 1. Remove lead particles suspended in the air
- 2. Increase occupant comfort

#### **DISADVANTAGES:**

No known disadvantages

#### **JUSTIFICATION:**

By exhausting air out of the space you in decrease the amount of suspended lead particles in the air of the space which decreases the amount of lead particles encountered by the occupants.

## VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 7 PAGE NO: 1 OF

DESCRIPTION: Add Ventilation to the Roof of the Shoothouse

	COST ESTIM	ATE WORKSHEET	· 	
Speculation Item # 7				
	DE	LETIONS		
	LINUTO	OLIANITITY	LINIT COCT	TOTAL
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
				\$0 \$0
				\$0 \$0
		Total Deletions		\$0 \$0
		Total Deletions		ΨΟ
	AD	DITIONS		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Roof ventilation fans	EA	1	\$433.14	\$433
				\$0
				\$0
				\$0
		Total Additions		\$433
		Net Cost Decrease	Э	-\$433
		Mark-ups	0.00%	\$0
		Total Cost Decrea	se	-\$433
All Mark-ups included in Un	it Prices. Contir	l ngency or S&I applie	d.	

#### **VALUE ENGINEERING COMMENTS**

#### Mechanical

<u>Comment 1:</u> Relocate compressor in latrine to attic or outside to minimize sound. Consider moving the blower outside to help minimize sound to occupants inside the facility. It could be placed in a louvered doghouse with a shingled roof. Keep the blower inside the facility, but replace the fenced/gated opening with a solid wall surface and sound attenuate the four walls and consider a double layer of gypsum board at the ceiling (or instead of a double layer of gypsum you could probably consider rolling batt insulation on top of ceiling).

<u>Comment 2:</u> Consider installing a thermostat for unoccupied setback in connection with lights or an occupancy sensor. This may result in an energy savings and the HVAC is only used when it is needed.

#### Electrical

<u>Comment 3:</u> Bring all electrical rooms up to code. Standard design should incorporate standard design narrative as well as Army Standard narrative on electrical general page, following the guidelines of UFC 3-520-01(Interior Electrical Systems,) UFC 3530-01(Interior and Exterior Lighting and Controls,) and UFC 3-550-03FA(Electrical Power Supply and Distribution).

**Comment 4:** Consider removing light dimming requirements.

<u>Comment 5:</u> Consider providing pole-mounted transformers instead of pad-mounted transformers.

**Comment 6:** Consider running electrical primary aerial instead of underground.

#### Architectural

**Comment 7:** Consider adding panels to the walls in order to reduce sound.

**Comment 8:** Consider installing cool roof.

# VALUE ENGINEERING TEAM STUDY APPENDICES

# **SUPPORTING DOCUMENTS**

# VALUE ENGINEERING TEAM STUDY APPENDIX A

# **CONTACT DIRECTORY**

# VALUE ENGINEERING TEAM STUDY APPENDIX A: CONTACT DIRECTORY & VE STUDY TEAM MEMBERS

NAME	ORGANIZATION	TELEPHONE
Tiffany Torres Value Engineering Officer VE Study Lead	US Army Corps of Engineers, Huntsville Engineering Center (CEHNC-ED-SC-O)	256-895-1643
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	Todd.Wood@usace.army.mil	

# VALUE ENGINEERING TEAM STUDY APPENDIX B

# VALUE ENGINEERING WORKSHOP AGENDA

#### VALUE ENGINEERING TEAM STUDY

#### APPENDIX B: VALUE ENGINEERING WORKSHOP AGENDA

# Value Engineering Workshop Agenda

Center of Standardization (COS) Live Fire Shoothouse Standard Design Huntsville, AL 9 – 11 April 2012

# **Monday 9 April (Operations Branch Conference Room)**

0900 - 0930 VE Study Kick-off & Introductions (VE Study Team & PDT)

0930 – 1000 Project Management Presentation (VE Study Team & PDT)

1000 - 1010 Break

1010 – 1130 Review of Project Information

1130 – 1230 Lunch Break

1230 - 1330 Function Analysis Phase

1330 – 1340 Break

1340 - 1500 Creative Idea Generation/Creative Phase

1500 - 1515 Break

1515 – 1600 Begin Evaluation of Ideas/Speculation Phase

# **Tuesday 10 April (Operations Branch Conference Room)**

0830 - 0930 Continue Speculation Phase

0930 - 0940 Break

0940 - 1030 Continue Speculation Phase

1030 – 1100 Assignment of Value Alternative/Proposal Development

1100 – 1130 Proposal Development (At Individual Desks)

1130 - 1230 Lunch Break

1230 – 1330 Status Update (Conference Room)

1330 – 1600 Continue Proposal Development (At Individual Desks)

# **Wednesday 11 April (Operations Branch Conference Room)**

0830 – 0900 Status Update (Conference Room)

0900 – 1200 Continue Proposal Development (At Individual Desks)

1200 Turn-in Proposals/Back-up Information Electronically

# VALUE ENGINEERING TEAM STUDY APPENDIX C

# **SPECULATION SHEET**

## VALUE ENGINEERING STUDY TEAM APPENDIX C: SPECULATION SHEET

P/C	Number	Description	Discipline
Р	1	Combine Latrine with AAR Building	Α
		Consider Enclosing Entire Facility to Minimize Sound Pollution	Α
Р	2	Utilize Solar Power for AAR and Ops Storage Facility	E
Р	3	Utilize Solar Power for Latrine	Е
С		Relocate Compressor in Latrine to Attic or Outside to Minimize Sound	A/M
Р	4	Spectrally Enhance Lighting	E
Р	5	Use LED Lighting for Outside Lighting	Е
		Lower Elevation of Shoothouse Roof	Α
С		Bring all Electrical Rooms up to Code (NEC)	E
С		Remove Light Dimming Requirements	E
Р	6	Delete Electrical Room of Shoothouse and Add Outdoor Panels	A/E
С		Provide Pole-mounted Transformers Instead of Pad-mounted	E
С		Run Electrical Primary Aerial Instead of Underground	E
С		Consider Adding Panels to Walls to Reduce Sound	Α
Р	7	Add Ventilation to the Roof of Shoothouse	Α
С		Consider Installing a Thermostat for Unoccupied Setback in Connection with Lights or an Occupancy Sensor	M
С		Cool Roof	Α

Legend: P – Proposal

C – Comment

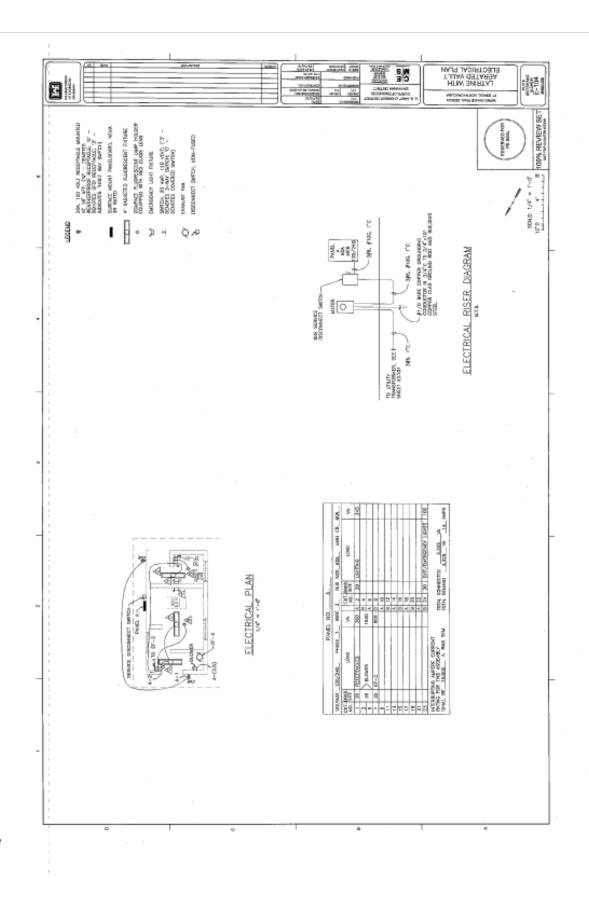
A – Architecture

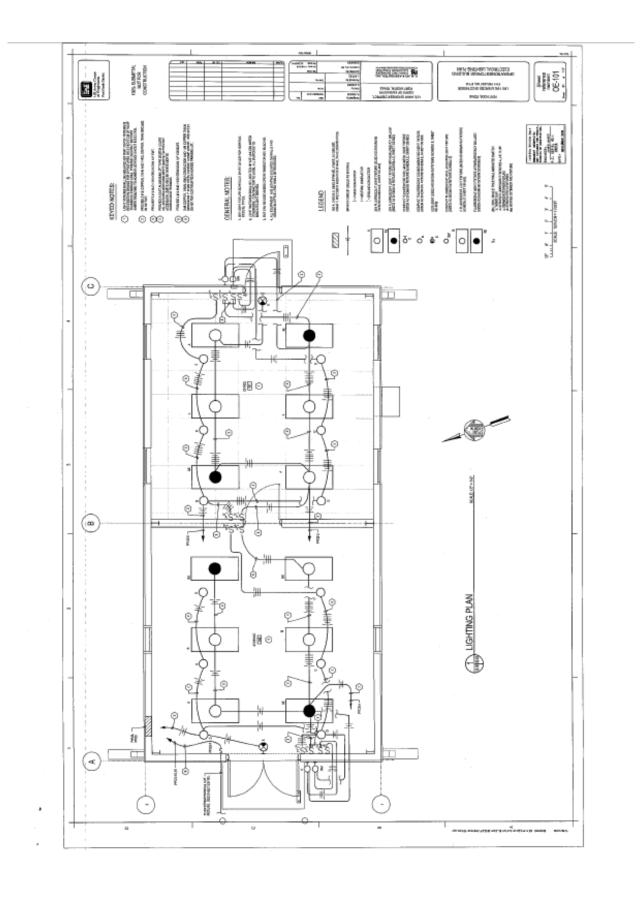
E – Electrical

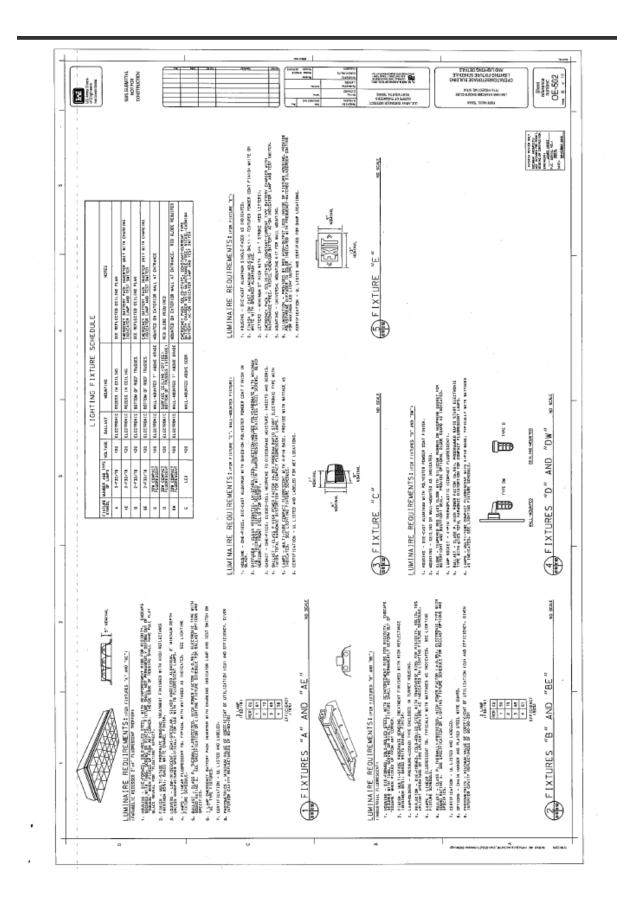
M - Mechanical

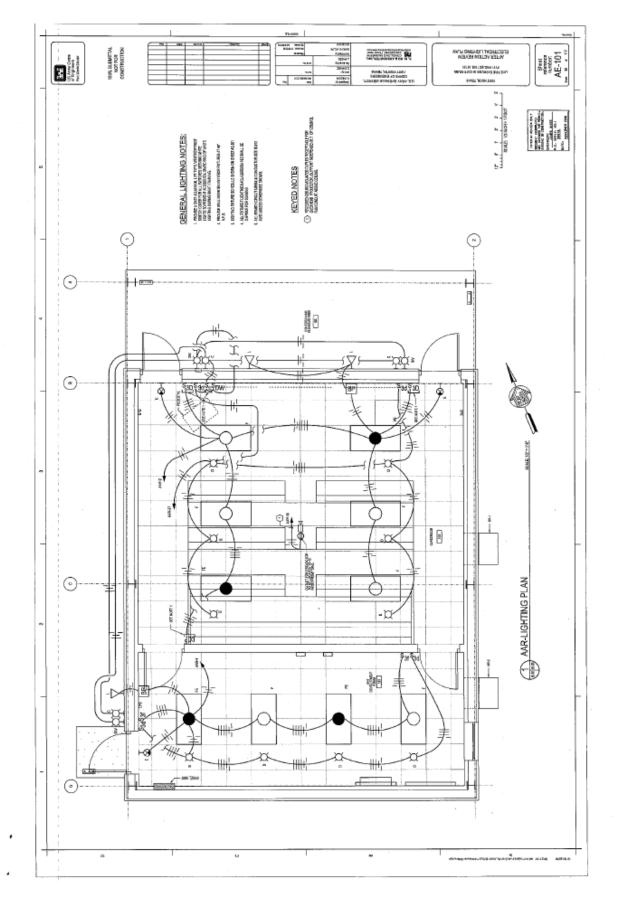
# VALUE ENGINEERING TEAM STUDY APPENDIX D

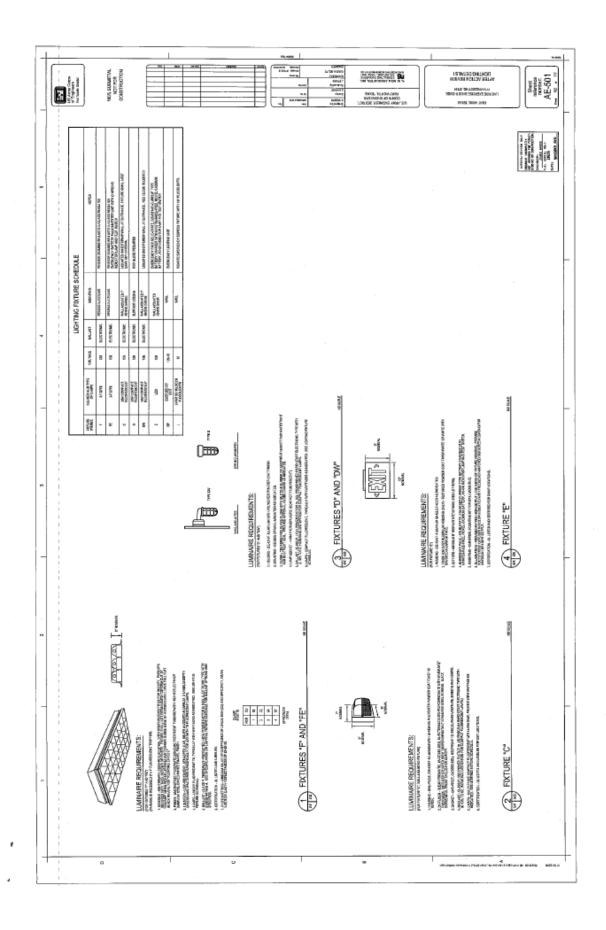
# **BACK-UP INFORMATION**

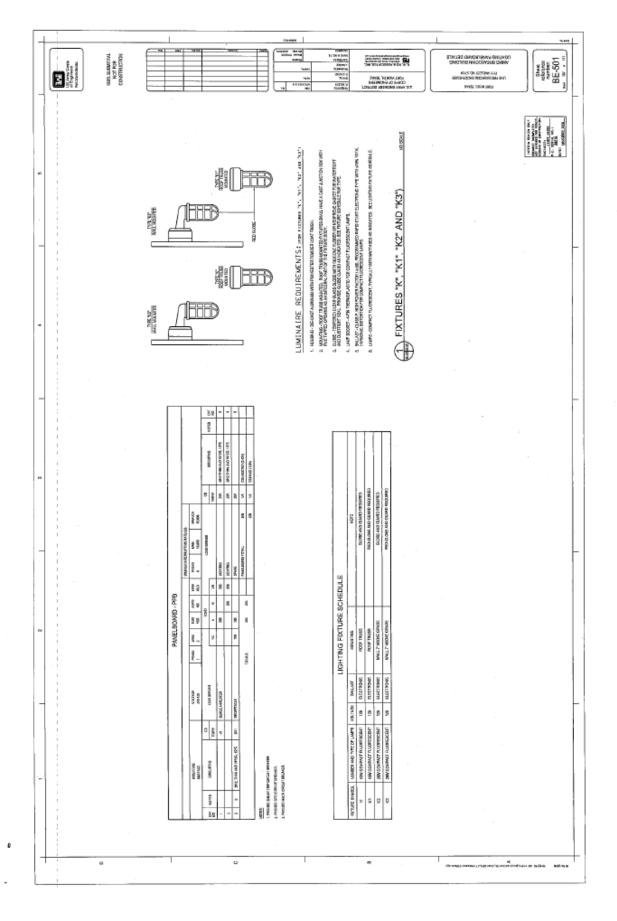


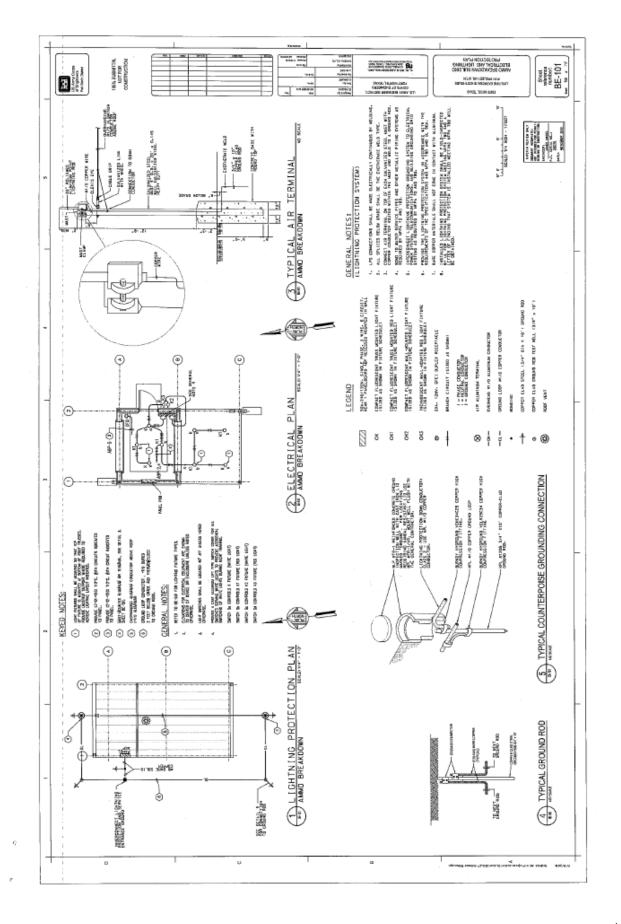


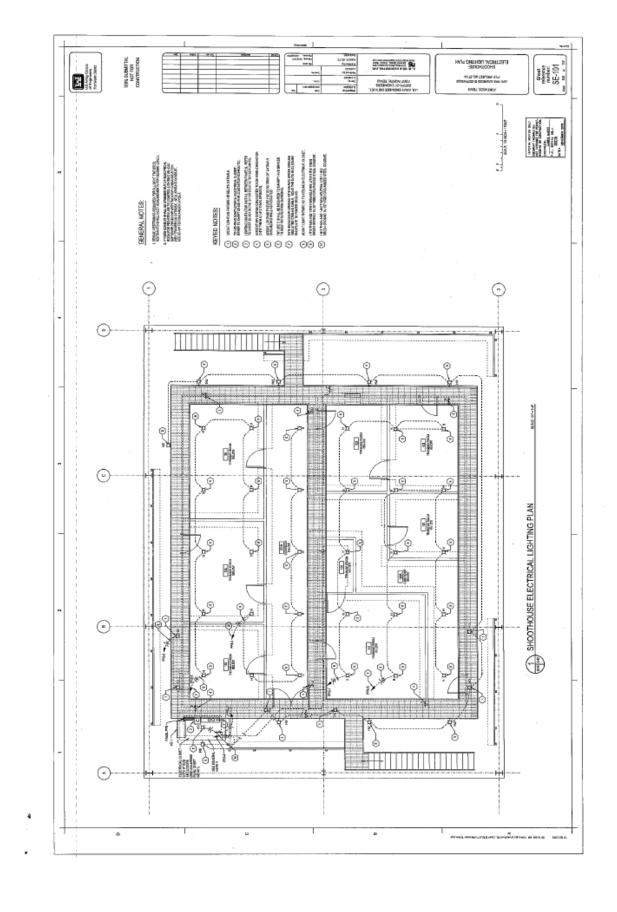


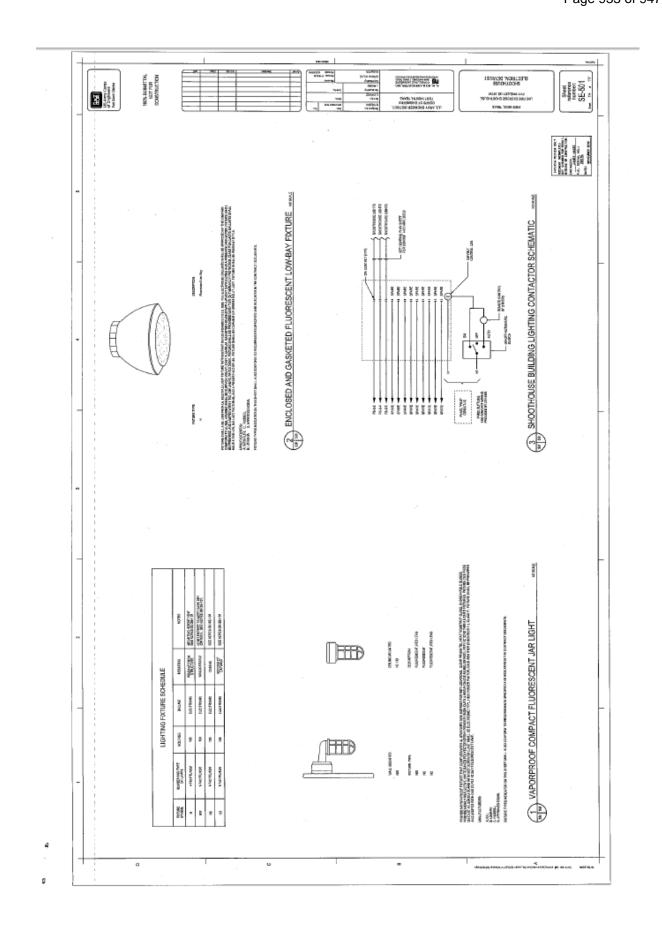


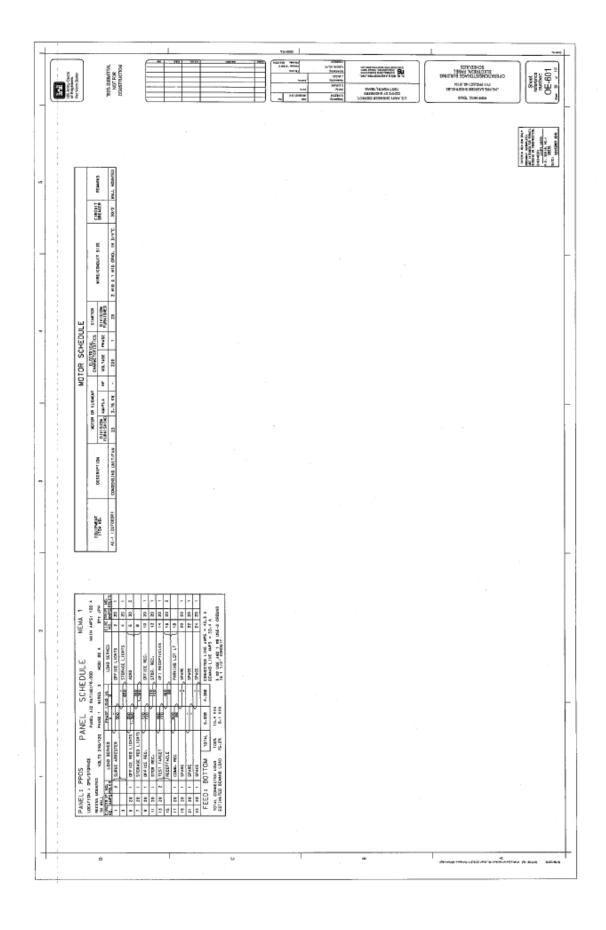


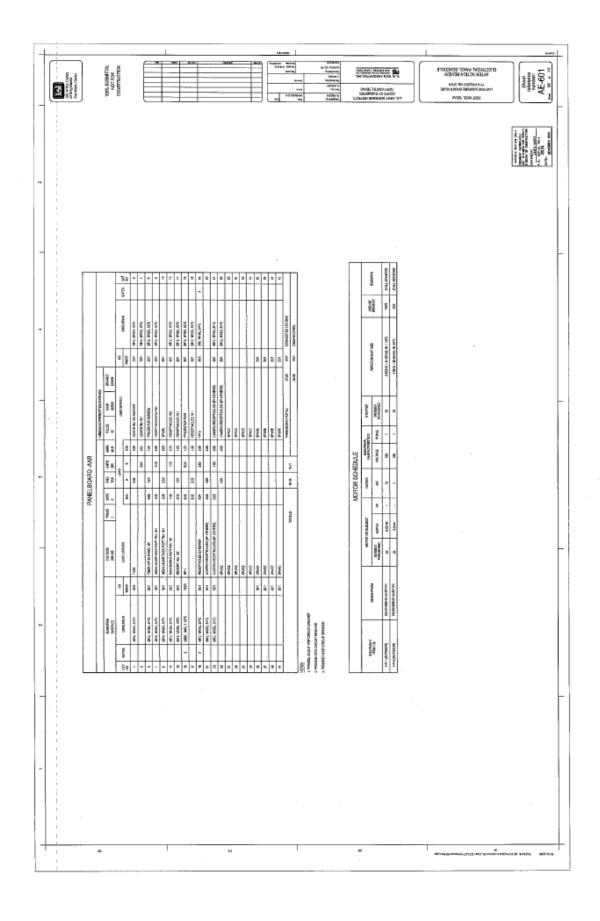












Section: Appendix EE

Assume the range will operate 6 days/week at 10 hours/day for 52 weeks/year

Assume the price of electricty is 8.81 cent/kwh

I reduced the number of light fixtures in the buildings.

		Prop	osal 4 P	Proposal 4 Post Retrofit Enhanced Lighting	t Enhanc	ed Lighting				
=======================================	Light Fixture	Number of	I				Total Energy used (KWH) per		5000k Lamp	
Building	Symbol	Light Fixture	Voltag		No. Lamps	Watts/lamp No. Lamps Power(watts)	year	Electricity	Price	
Latrine	C	3	120	32	3	96	300	\$26.39	\$9.95	
Latrine	B, BE	2	120	25	4	100	312	\$27.49	\$7.48	
Operation/Storage	B, BE	10	120	25	20	200	1560	\$137.44	\$7.48	
Operation/Storage	C	2	120	32	2	64	200	\$17.59	\$9.95	
Operation/Storage	DW, D	10	120	32	10	320	998	\$87.96	\$14.45	
Ammo Breakdown	×	8	120	45	8	336	1048	\$92.36	\$16.88	
After Action Review	F, FE	7	120	25	21	525	1638	\$144.31	\$6.96	
After Action Review	DW	3	120	37	3	96	300	\$26.39	\$14.45	
After Action Review	0	33	120	32	3	96	300	\$26.39	\$9.95	

Assume the range will operate 6 days/week at 10 hours/day for 52 weeks/year

Assume the price of electricty is 8.81 cent/kwh

			Proposa	14 Pre Retro	ofit Enhan	Proposal 4 Pre Retrofit Enhanced Lighting				
		Number of				Connected	Total Energy	Cost of		
Building	Light Fixture Symbol	Light Fixture	Voltage	Watts/Jamp	No. Lamps	Power(watts)	per year	Electricity	Standard Lamp Price	
Latrine	O	3	120	32	3	96	300	\$26.39	\$5.29	
Latrine	B, BE	2	120	25	4	100	312	\$27.49	\$7.48	
Operation/Storage	B, BE	12	120	25	24	009	1872	\$164.92	\$7.48	
Operation/Storage	J	2	120	32	2	19	200	\$17.59	\$5.29	
Operation/Storage	DW, D	14	120	32	14	448	1398	\$123.14	\$3.08	
Ammo Breakdown	×	10	120	42	10	420	1310	\$115.45	\$4.30	
After Action Review	F, FE	10	120	25	30	750	2340	\$206.15	\$6.96	
After Action Review	MQ	3	120	32	3	96	300	\$26.39	\$3.08	
After Action Review	3	3	120	32	3	96	300	\$26.39	\$5.29	

Appendix FF

**UXO Survey** 

Section: Appendix FF

FINAL MEMORANDUM FOR RECORD 7/24/12

Section: Appendix FF

SUBJECT: UXO Survey, FY 13, Live Fire Shoot House, Project # 71713, Ft Campbell, KY.

TO: CEHNC-OE-DC (Bill Sargent, Ken Hewitt) Huntsville Engineering & Support Center Huntsville, AL

On December 21, 2011, a UXO Survey was was conducted at the subject project site Fort Campbell, KY. As part of the design process, the survey was accomplished in response to the planning charrette memo.

The proposed Live Fire Shoot House will be located within Range Area 44, which is the current location of a 1991 vintage wood structure shoot-house. The Archive Search Report, dated February 1999, states that a previous use may have been an MOU1 Assault Course. Type of Weapons to be Fired: M1SA1, M16A2, M249 SAW, M60 MG (blank fire only), pistol, and shotgun. The general grid coordinate gathered during the site visit was UTM 16 440620E, 4053591N.

Three personnel from Huntsville Center OE Range Team mobilized to the site on December 21, 2011. The site was overlain with 30 meter spaced transects. The survey team traversed 1.84 miles of transects across the site. During the survey one notable Munitions Debris (MD) was discovered. The MD was believed to be a 155mm Base Ejection Projectile Nose Cone. Small arms debris was present as well. Large counts of subsurface ferrous anomalies were observed at the site. However, the anomalies believed to be from trash pits and/or miscellaneous Range Related Debris (RRD). For example a large amount of tires were noted to have been buried at the site. Mass grading has occurred at the site with no known UXO incidences. The site has a long history of small arms use.

The following is the recommendation from the planning charrette memo written by Tommy Hunt: "No OE Reconnaissance Survey is necessary for this range location or ROCA area. However, this whole facility sits within and will remain within the Impact Area, and communications utilities will be running due north out of the proposed Shoot House location to connection points. This site should be considered when the OE Reconnaissance's are performed for the other ranges at Fort Campbell, to support the utilities required for this proposed new construction, to validate site conditions and verify UXO risk."

Based on the field observations, known history and the initial planning charrette assessment, all evidence indicates that the site is a **Low Risk** of encountering explosive hazards. The recommendation for the site is **Standard Contractor Awareness Training.** 

Jason Burcham Engineer

## **Exemptions and Clarifications**

- 1) Sec 01 10 00 Para 3.3.8.: The shoothouse will be served by 120/240V 1 phase, 3 –wire secondary power.
- 2) Sec 01 10 00 Para 3.3.8. (10): There is no ROC Tower and down range communication. The fiber optic cable shall extend from the AAR (After Action Review) structure to the shoot house wall mounted data enclosure.
- 3) Sec 01 10 00 Para 5.7.5.1 (e): The design shall provide a lighting schematic stating the size of the contactor and illustrating how the contactor controls the interior lights. The design shall provide a mounting detail for the pendant mounted interior fixtures; consideration should be taken in the fixture mounting design so that there is no swaying of the fixtures due to environmental forces (i.e. wind, concussions from training).
- 4) Sec 01 10 00 Para 6.9.5: A wall mounted data enclosure shall be installed at the Shoothouse. The Shoothouse data enclosure shall be a NEMA 4 wall-mounted enclosure sized at 3' wide x 4' high x 10" deep. The fiber optic patch panel shall be located in the bottom left-hand corner of the data enclosure. The designer shall ensure this patch panel does not exceed 9.5" high x 13.5" wide section of the data enclosure. All strands of the fiber optic cable shall be terminated on the fiber patch panel using SC type connectors. The SC connectors shall be individually and permanently labeled showing cable destinations. A dedicated 120V, 20A duplex receptacle shall be installed in the bottom right-hand corner of the data enclosure. The designer shall ensure the space required in the data enclosure is minimized for the location of this receptacle. All CAT 6 data cables serving UTOs throughout the Shoothouse shall be routed into the data enclosure. The CAT 6 cables shall be terminated with male RJ-45 connectors, and this cable shall be routed so that a two meter service loop is available within the data enclosure. Service loop should be routed around interior perimeter of enclosure to maximize the available space for installation of future equipment. All data cables shall be permanently tagged adjacent to the applicable conduit penetration stating the cable destination.
- 5) Sec 01 10 00 Para 6.10: Data shall be provided as a minimum 12-strand direct-buried, single mode fiber optic cable with a metallic armored jacket. The fiber optic cable shall extend from the AAR (After Action Review) structure to the shoot house wall mounted data enclosure. A coated rigid steel conduit extended a minimum of 1524 mm (5') from the structure will be installed for all data circuits entering or leaving the shoot house structure. Innerduct shall be installed in conduits where fiber optic cable enters the building.
- 6) Sec 01 10 00 Para 6.11: The standard method of climate control for the Shoothouse is ventilation cooling and is to be provided via an exhaust fan and a motorized damper/louver combination in the electrical room of the Shoothouse. The designer shall

- provide a thermostatically controlled exhaust fan. Controls shall activate fan and louver/damper operation at a thermostat set point of 90° F (32.2° C). The fan should have adequate capacity to limit the room temperature to a maximum of 10 degrees F (6 degrees C) above the outdoor temperature when both equipment and envelope loads are at their maximum peak (per UFC 3-410-01FA).
- 7) Sec 01 33 16 Para 3.5.2.4: Current version of UFC 4-010-01 dated 9 Feb 2012 only has 21 standards.
- 8) Sec 01 10 00 Para 6.15.1.3: Waste Management Plan (WMP): add (j) to read " a Waste Management Support Form (Form A) will be completed and submitted by the contractor. See appendix BB . 6.16.2.6 Air Permits: Add "The Equipment Listing form will be completed and submitted by the contractor as part of the analysis. See appendix AA. Section 01 57 23 Section 3, Erosion and Sediment Control, 3.4, Construction on Stream Banks and in Streams: delete from paragraph 2, "haybales". Grading and Excavation: paragraph 7, delete "haybales" 5.3 Maintenance: 1st paragraph Change "at least once a week" to read " twice weekly". Add " Inspections will be performed by and individual who has attended and completed the 8 hour Tennessee Department of Conservation and Environment (TDEC) Erosion and Sediment Control Course.
- 9) Sec 01 10 00 Paragraph 5.8.2.1 and 6.11: The Range Design Guide requires that the HVAC equipment maintain an operational environment of 72 degrees +/- 2 degrees F for the data racks in the AAR Development Room.
- **10**) **Sec 01 10 00 Para 6.11:** The estimated heat release for the facilities is as follows: AAR Development Room, 16,497 Btu/hr; AAR Classroom 6,210 BTU/hr; LFSH Electrical/Comm Room, 6,278 BTU/hr.
- 11) Sec 01 10 00 Para 6.14.1: LEED is not required for this project.
- **12**) **Sec 01 10 00 Para 5.8.5:** Commissioning is not required for these facilities. Contractor shall perform a manufacturer's equipment start up and TAB.
- 13) Sec 01 10 00 Para 5.8.3: An integrated DDC system that is tied into the Base EMCS system is not required.
- 14) Sec 01 10 00 Para 6.3.2.2 (a): Dumpster Enclosures are not required for this project.(b) Bollards shall be provided around all pad mounted transformers and mechanical equipment.
- **15**) **Sec 01 10 00 Para 6.4.6.2:** Water Distribution and Sanitary Sewerage System is not required for this project.
- 16) Sec 01 10 00 Para 6.4.4.1: Pavements over cohesive soils require under drains to be installed beneath the pavement.
- 17) Sec 01 10 00 Para 6.4.7: Compaction shall be done in accordance with ASTM D1557.
- **18) Sec 01 10 00 Para 6.16.2:** Fort Campbell is required to have Title V permits from the states of Kentucky and Tennessee. All new stationary potential or actual sources of air pollutants or modifications to existing stationary sources of air pollutants must be reviewed to determine if the air pollutant source is affected by any state or federal rule establishing standards for the source and if the operation of the source meets those

Section: Appendix GG Page 942 of 947

standards, and if any modifications to the Title V permits will be required. The procedure includes obtaining permission for construction, installation, or modification (hereafter referred to as construction) of the air pollutant source and then obtaining subsequent permission for operation of the stationary air pollutant source. Stationary air pollutant sources include, but are not limited to: fossil fuel burning equipment such as boilers, hot water heaters, and non-portable off road reciprocating engines such as used for generating electricity (prime or emergency generators); coating operations involving the application of paints, paint strippers, adhesives, plating (including polishing process), or any other product to a substrate; use of abrasive blasting material for the preparation of substrates for further work. The contractor constructing the air pollutant source must provide the information necessary for the Fort Campbell Environmental Division, Air Ouality Program to determine the compliance status of the source(s) with any applicable Clean Air Act related federal or state rule and to determine if an application for a modification to a Title V permit is required. That information includes providing manufacturers specifications for the air pollutant source, any available test results of exhaust emissions, and the schedule for the construction of the air pollutant source. Construction of an air pollutant source cannot be started until the decision concerning permitting requirements is made. If a Title V permit modification is required, the lead time for the processing of the permit application by the Air Quality Program and the federal/state regulatory agencies can vary from 30 days to six months depending on the magnitude of the potential annual emission rate of air pollutants and the requirements of any applicable federal or state rule. The expeditious obtaining of complete and accurate information concerning the new source can often result in minimizing the time in both the submittal of the permit application and the required reviews by the affected regulatory agencies.

- 19) Sec 01 10 00 Para 6.16.2.3: Data is required to enable the Air Quality Program, Fort Campbell Environmental Division, to calculate the estimated emissions of ozone precursors resulting from construction equipment (mobile and stationary) burning fossil fuels and other Contractor vehicles (Contractor or privately owned) operated on Fort Campbell as a result of the construction contract. Once the contract is awarded, please have the contractor contact the Air Quality Program office at (270)798-9598 or (270)798-9603. See 6.16.2.6 for examples of construction equipment and activities which need to be identified as to their usage.
- 20) Sec 01 10 00 Para 6.16.2.5: In addition to the data concerning ozone precursor emissions during the construction phase, data are also required to estimate what the emissions will be after the completion of the construction project. This includes evaluations to determine emission increases of ozone precursors resulting from any new permanent stationary sources; any potential increase in vehicle miles traveled by fossil fueled tactical, other federal Government owned, and private owned vehicles; and any increase in demands on current utility services (boiler plants, water plants, etc.). This data

- will be included in the GCR checklist that is required to be completed by the contractor prior to commencement of the project.
- 21) Sec 01 10 00 Para 6.16.2.5(a): Fuel Burning Equipment (Natural Gas and/or Fuel Oil): For boilers > 10 MBTU or for any boiler that uses fuel oil, contact the Air Quality Program with specifications for boilers. For hot water heaters > 120 gallons, contact the Air Quality Program with specifications for hot water heaters. Stationary reciprocating internal combustion engines used to generate electricity (emergency or prime) contact the Air Quality Program with manufacturer's specifications and results of exhaust emission tests.
- 22) Sec 01 10 00 Para 6.16.2.5(g): Specifications for any booth that has the potential to release emissions into the ambient air must be submitted to the Air Quality Office for review prior to construction. The Air Quality Program will determine the permit and/or recordkeeping requirements. Booth examples include spray booths, composite reset booths, blasting booths, etc.
- 23) Sec 01 10 00 Para 6.4.6.6: CACTV is not required for this project.
- 24) Sec 01 10 00 Para 6.13: Fire Alarm System is not required for this project.
- 25) Sec 01 10 00 Para 6.9.4: Street and area Lighting is not required for this project.
- **26**) **Sec 01 10 00 Para 6.15.8:** Aboveground Fuel storage Tanks (ASTs) are not required for this project.
- **27**) **Sec 01 57 20 Para 1.2.3.10 addition:** (g) A Site Specific Spill Plan Form will be completed and submitted to the government by the contractor. This form will be furnished by the government.
- **28**) **Sec 01 57 20 Para 1.2.3.11:** Solid Waste: A Waste Diversion Form will be completed and submitted to the government by the contractor. This form will be furnished by the government.
- **29**) **Sec 01 57 20 Para 1.2.3.13:** Air Pollution: An Air Pollution General Conformity Rule Form will be completed and submitted to the government by the contractor. This form will be furnished by the government.
- **30) Sec 01 57 20 Para 3.1.3:** Erosion and Sediment Controls: add "all control measures must be in place prior to any land disturbing activities begin". Also, last sentence should read "Remove any temporary measures after the area has been stabilized to 95% ground cover".
- **31) Appendix DD, Sec 28 31 76:** Per the Installation Fire Dept, only local detectors and fire extinguishers are required. Also, a mass notification system is not required for this project. Provide UFGS 28 31 00.00 10 Fire Detection and Alarm System.
- **32) Sec 01 33 16 Par 3.5.2.10:** Add "Standard and emergency/egress lighting calcs shall indicate the minimum, average, and uniformity values for all applicable areas."
- 33) Sec 01 10 00 Para 6.4.6.1(b): Electrical and communication lines that pass under the roadway should be encased in concrete ductbank.

- **34)** Sec 01 32 01.00 10 Para 3.3: Computer Software System utilized shall be P 6.2 or greater.
- **35**) **Sec 01 32 01.00 10 Para 3.4:** Contractor is required to attend a Schedule Expectations Kick-off Meeting, SEKO in conjunction with developing the preliminary schedule.
- 36) Sec 01 10 00 Para 5.9.4.10 (6): Web address: https://eko.usace.army.mil/public/fa/bas/
- **37**) **Sec 01 10 00 Para 6.10.5:** Copper distribution cable must be terminated at the TR on 110- type cabinet or rack- mounted patch panels compliant with Cat 6 for general projects. Very small projects (i.e., less than 10 user telephones) may use an EIA/TIA category qualified block or backboard mounted patch panel.
- **38) Sec 01 10 00 Para 6.10.4:** FOPP Fiber optic panels will be installed in cabinets or racks that house the LAN equipment. No fiber optic patch panels will be installed on backboards unless specified by the NEC.
- 39) Sec 01 10 00 Para 6.16.2: Fort Campbell is required to have Title V permits from the states of Kentucky and Tennessee. All new stationary potential or actual sources of air pollutants or modifications to existing stationary sources of air pollutants must be reviewed to determine if the air pollutant source is affected by any state or federal rule establishing standards for the source and if the operation of the source meets those standards, and if any modifications to the Title V permits will be required. The procedure includes obtaining permission for construction, installation, or modification (hereafter referred to as construction) of the air pollutant source and then obtaining subsequent permission for operation of the stationary air pollutant source. Stationary air pollutant sources include, but are not limited to: fossil fuel burning equipment such as boilers, hot water heaters, and non-portable off road reciprocating engines such as used for generating electricity (prime or emergency generators); coating operations involving the application of paints, paint strippers, adhesives, platings (including polishing process), or any other product to a substrate; use of abrasive blasting material for the preparation of substrates for further work. The contractor constructing the air pollutant source must provide the information necessary for the Fort Campbell Environmental Division, Air Quality Program to determine the compliance status of the source(s) with any applicable Clean Air Act related federal or state rule and to determine if an application for a modification to a Title V permit is required. That information includes providing manufacturers specifications for the air pollutant source, any available test results of exhaust emissions, and the schedule for the construction of the air pollutant source. Construction of an air pollutant source cannot be started until the decision concerning permitting requirements is made. If a Title V permit modification is required, the lead time for the processing of the permit application by the Air Quality Program and the federal/state regulatory agencies can vary from 30 days to six months depending on the magnitude of the potential annual emission rate of air pollutants and the requirements of any applicable federal or state rule. The expeditious obtaining of complete and accurate information concerning the new source can often result in minimizing the time in both the

submittal of the permit application and the required reviews by the affected regulatory agencies.

- **40) Sec 01 10 00 Para 6.16.2.3:** Data is required to enable the Air Quality Program, Fort Campbell Environmental Division, to calculate the estimated emissions of ozone precursors resulting from construction equipment (mobile and stationary) burning fossil fuels and other Contractor vehicles (Contractor or privately owned) operated on Fort Campbell as a result of the construction contract. Once the contract is awarded, please have the contractor contact the Air Quality Program office at (270)798-9598 or (270)798-9603. See 6.16.2.6 for examples of construction equipment and activities which need to be identified as to their usage.
- 41) Sec 01 10 00 Para 6.16.2.5: In addition to the data concerning ozone precursor emissions during the construction phase, data are also required to estimate what the emissions will be after the completion of the construction project. This includes evaluations to determine emission increases of ozone precursors resulting from any new permanent stationary sources; any potential increase in vehicle miles traveled by fossil fueled tactical, other federal Government owned, and private owned vehicles; and any increase in demands on current utility services (boiler plants, water plants, etc.). This data will be included in the GCR checklist that is required to be completed by the contractor prior to commencement of the project.
- **42) Sec 01 10 00 Para 6.16.2.5(a):** Recommend the paragraph read: Fuel Burning Equipment (Natural Gas and/or Fuel Oil): For boilers > 10 MBTU or for any boiler that uses fuel oil, contact the Air Quality Program with specifications for boilers. For hot water heaters > 120 gallons, contact the Air Quality Program with specifications for hot water heaters. Stationary reciprocating internal combustion engines used to generate electricity (emergency or prime) contact the Air Quality Program with manufacturer's specifications and results of exhaust emission tests.
- **43**) **Sec 01 57 00 Attachment 4:** The less than 5 acre SWPPP needs to be submitted as a separate document with all storm water control drawings as identified in Appendix A and B of the SWPPP document. As stated in paragraph 1.2.1 section 01 57 00, contractor will meet with the contracting officer during the pre-construction meeting to discuss the SWPPP in its entirety prior to start of project.
- **44**) **Sec 01 10 00 Para 6.10.8:** Provide lightning protection, based on NFPA 780 (2011) Annex L Lightning Risk Assessment of the facility.
- **45**) **Sec 01 33 16 Para 3.9.1:** Add \*\*\* Note: U.S. Army Corps of Engineers Construction Area Office requires 4 copies of DWGS, Design Analysis and Specs at the Released For Construction Stage.
- **46) Sec 01 50 02 Para 1.6.1:** Replace 1.6.1 Resident Engineer's Office: Provide the Government Resident Engineer with an office, approximately 200 square feet in floor area, located where directed and providing space heat, electric light and power. Include a 4 by 8 foot plan table, computer work space, a standard size office desk and chair. At completion of the project, the office will remain the property of the Contractor and be removed from the site. Utilities will be connected and disconnected in accordance with

local codes and to the satisfaction of the Contracting Officer. 1.6.2 Trailer-Type Mobile Office: The Contractor may, at its option, furnish and maintain a trailer-type mobile office acceptable to the Contracting Officer and providing as a minimum the facilities specified above. Securely anchor the trailer to the ground at all four corners to guard against movement during high winds.

- **47**) **Sec 01 10 00 Project Definition Matrix:** Downrange Area Change Lighting Protection to Lightning Protection.
- **48**) **Sec 01 10 00 Para 6.9.3:** The primary voltage on site should be 14.4KV instead of 12.47KV.
- **49**) **Sec 01 10 00 Para 6.2.2:** Building Automation System This is not required for this project.
- 50) Sec 01 10 00 Para 6.4.11: Landscaping This is not a requirement for this project.
- 51) \*\*(AM #0003)\*\* Sec 01 10 00 LFSH Definition Matrix and Para 6.17: Lead abatement of the shoothhouse shall follow the OSHA Construction Standard for Lead, 1926.62 requirements. The sand with lead particles shall be placed near the berm as shown in the Site Plan for the location. The plywood with lead particles shall be place directly behind the existing shoothouse in front of the UXO signs (as shown on the Site Plan). The wood truss system and catwalk will be removed and disposed offsite by the contractor. The rubber/mats with lead particles from the existing shoothouse deconstruction/demolition will need to be disposed of by the contractor. Contractor shall follow Fort Campbell Design Guide Specification for requirements for the Lead Removal and Disposal. Contractor may need to conduct a lead sample test on the rubber mats to determine disposal procedures based Specification Section 02 83 33.13 20 in the Fort Campbell Technical Design Guide (FTC TDG) and 40 CFR 260-265, 268. Specification 02 83 33.13 20 will need to be revised/tailored in the design submittals.

**Separate Note:** The Conex boxes near the existing shoothouse shall be removed from the project area by the contractor and disposed. Also, the steel truss roofing structure will need to be disposed of by the contractor. The wood columns shall be removed and placed near the berm for the Range Control's use at a later date.

- 52) \*\*(AM #0003)\*\* Sec 01 10 00 Para 3.5: Contractor shall supply the ballistic wall supplier as part of the proposal.
- 53) \*\*(AM #0003) \*\* Sec 01 33 16 Para 3.5.7: No building rendering is required.
- **54**) \*\*(**AM** #0003)\*\* **Appendix DD Para 2.0.5**: Fort Campbell has a network of NGS control points that should be used for all projects on the base. A minimum of 2 and preferably 3 of the points should be used to establish project control.
- 55) \*\*(AM #0003)\*\* Appendix J: Contractor shall tie new service fiber splice into existing manhole outside the entrance to Range 44. If the I3MP Refresh fiber line is not completed before the contractor needs to splice service line into the I3MP Refresh line then contractor shall install a quazite/pull/splice box at the entrance of Range 44 and to leave the fiber coiled and protected until the NEC contractor finishes the work up to Range 44.
- **56**) \*\*(**AM** #**0003**)\*\* Caliber of Rifle will be a 5.56.

- 57) \*\*(AM #0003)\*\* Sec 01 10 00 Para 5.6.2.7: Inspection and testing of the air barrier system is required on all buildings that have conditioned space over 5,000 SF. The air barrier system for buildings or spaces of less than 5,000 SF is only required to be inspected and not tested.
- 58) \*\*(AM #0003)\*\* Sec 01 33 16 Para 3.5.3.3: 1<sup>st</sup> Sentence Delete geotechnical and change Contractor's to contractors. 2<sup>nd</sup> Sentence Change geotechnical engineer to Geotechnical Engineer and replace first with final. 3<sup>rd</sup> Sentence Delete entire sentence.